NCERT PAGE QUESTION PHYSICS MOTION

QUESTION (PAGE-74)

***Question - 1 - An object has through a distance. can it have zero displacement? If yes, support your answer with an* example.**

Answer - An object which has moved through a distance can have zero displacement. This happens when the initial point and final point of motion is same.

Q.2. A farmer moves alo0ng the boundary of a square field of side 10 m in 40 s. What will be the magnitude of displacement of the farmer at the end of 2 minutes 20 seconds?

Answer = Total distance moved by the farmer in 40 s,

$$= 10 + 10 + 10 + 10 = 40 \text{ m.}$$

Time = 2 minutes and 230 seconds

$$= 140 \text{ seconds.}$$

So, he completes 3 rounds in 140 seconds. distance covered in 20 seconds = 20 m.

So, if he starts from A, after 140 s, he will be on position C.

Now $AC^2 = AB^2 + BC^2 + = 10^2 + 10^2 = 200$

So, $AC = \sqrt{200} = 10\sqrt{2}$.

Hence, after 2 minutes 20 seconds his displacement is $10\sqrt{2}$ m.

Question - 3 - Which of the following is true for displacement?

(a) It cannot be zero. (b) Its magnitude is greater than the distance travelled by the object.

Answer - (a) and (b) both are not true for displacement.

QUESTION (PAGE-76)

Question -1 - Distinguish between speed and velocity.

Answer - Speed of an object is the distance per unit time and velocity is the displacement per unit time.

Question - 2 - Under what condition (s) is the magnitude of the average velocity of an object equal to its average speed?

Answer - A average velocity and average speed of an object is equal if its distance covered in equal to displacement.

Question - 3 - What doers the odometer of an automobile measure?

Answer - The odometer of an automobile measures the distance travelled by an automobile.

Question - 4 - What does the path of an object look like when it is in uniform motion?

Answer - The path of an object looks like a straight line when it is in the same direction.

Question - 5 - During an experiment, a wireless signal reached the ground in 5 minutes. What was the distance of spaceship? (Take speed of wireless signal = speed of light = 3×10^8 m s^{-1}).

Answer - Time taken for signal to reach

= 5 min = 5 × 60 s = 300 s.

Speed of signal

= 3×10^8 ms^{-1}.

Distance of spaceship

= Speed of signal × Time

= $3 \times 10^8 \times 300$

= 9×10^{10} m.

QUESTION(PAGE-77)

Q.1. When will you say body is in

(a) uniform acceleration?

(b) non-uniform acceleration/

Ans. (a) An object is in uniform acceleration, if its velocity increases or decrease by equal amounts in equal intervals of time however< small the time interval may be.

(b) An object is in non-uniform acceleration if its velocity increases or decrease by unequal amounts in equal intervals of time.

Q.2. A bus decreases its speed from 80 kmh^{-1} to 60 kmh^{-1} in 5s. Find the acceleration of the bus.

Ans. given, initial speed (u) = 8 0 kmh^{-1}

= 80×1000m/60×60s = 200/9 ms^{-1}

Final velocity (v) = 60×1000m/60×60s = 50/3 ms^{-1}

Time (t) = 5s

We know that acceleration (a)

= v-u /t 50/3 - 200/9 m/s^2

= -50 /9×5 m/s2 = - 1.1 m/s^2.

Q.3. A train starting from a railway station and moving with uniform acceleration attains a speed of 40 km h^{-1} in 10 minutes calculate its acceleration.

Ans. Initial speed, u = o.

Final speed v= 40km h^{-1}

= 40,000 m/3,600 s

= 11.111 ms^{-1}

time (t) = 10 min = 10×60s

= 600 s.

Now, $v = u + at$ or $a = v-u/t$

Acceleration = 11.111 $ms^{-1}/600s$

= 0.0185 ms^{-1}

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QUESTION (PAGE-81)

Q.1. What is the nature of the distance-=time graphs for uniform and non-uniform motion of an object?

Ans. Distance-time graph for uniform motion is a straight line and f0r non-uniform motion, it is a curved line.

Q.2. What can you say about the motion of an object whose distance distance - time graph is a straight line parallel to the time axis?

Ans. If distance-time graph is a straight line parallel to the time axis, the object is in rest.

Q.3. What can you say about the motion of an object if its speed-time graph is a straight line parallel to the time axis?

Ans. If speed-time graph is a straight line parallel to the time axis, it shows that object is moving with constant speed.

Q.4. What is the quantity which is measured by the area occupied below the velocity-time graph?

Ans. Displacement of an object is measured by the area occupied below the velocity-time graph.

QUESTION (PAGE-82)

Q.1. A bus starting from rest moves with uniform acceleration of 0.1 ms^{-1} for 2 minutes. Find: (a) the speed acquired, (b) the distance travelled.

Ans. Initial velocity (u) = 0

Acceleration (a) = 0.1 ms^{-1}

Time taken (t) = 2 min

t = 2×60s = 120s.

(a) Speed acquired (v)

$$v = u + at$$

$$= 0 + 0.1\ ms^{-1} \times 120s$$

(b) Distance travelled (s)

$$= U\,t + 1/2\ at^2$$

$$s = 0 + 1/2 \times 0.1\ ms^{-2} \times (120s)^2$$

$$= 720\ m.$$

Q.2. A train is travelling at a speed of 90km/h. The brakes are applied so as to produce a uniform acceleration of - 0.5 ms^{-1}. Find how far the train go is before it is rough to rest?

Ans. Given **u = 90 km/h**

$= 90 \times 1000$ m/ 3600s = 25 m/s

$u = 25\ ms^{-1}$

$v = 0$

$a = -\ o.5\ ms^{-2}$

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

$s = v^2 - u^2 / 2as = 0 - (25)^2 / 2 \times (-0.5)$

$= -625/-1.0$

$= 625m$

Q.3. A trolley wheel going down an inclined plane has an acceleration of 2 cm s^{-2}. what will be its velocity 3 second after the start?

Ans. Initial velocity (u) = 0

Acceleration (a) = 2 cm s^{-2}

Time (t) = 3s

Final velocity (v) = u + at = 0 2 × 3

= 6 cm s^{-1}

Q.4. A racing car has a uniform acceleration of 4 m/s^2. What distance will it cover in 10s after the start?

Ans. $s = Ut + 1/2\ at^2$

$= 0 + 1/2 \times (4) \times {}^{(10)} = 200$ m.

Q.5. A stone is thrown in vertically upward direction with a velocity of 5 ms^{-1}. If the acceleration of the stone during its motion be 10 ms^{-2} in downward direction, what will be the height attained by the stone and how much time will it take to reach there?

Ans. u = 5 ms^{-1}

a = - 10 ms^{-2}

v = 0.

(We know that when stone will be at the maximum height its velocity will be zero).

We have $v = u + at$

$0 = 5 + 9\text{-}10)\ t$

$10\ t = 5$

$t = 0.5$ s.

Also, $s = u\ t + 1/2\ at^2$

$s = 5 \times 0.5 + (-10) \times 1/2 \times 0.5^2$

$= 1.25$ m.

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NCERT EXERCISES:

Q.1. An athlete completes one round of a circular track of diameter 200 m in40s. What will be the

distance covered and the displacement at the end of 2 minutes 20 s?

Ans. **d = 200 m**

r = 100 m

T = 40s

t = 140 and

No. of revolution = Total time / Time period

= 140/40 = 3.5 revolution

(i) Distance travelled

= (2πr) × (No. of revolution)

= 2 × 3.14 × 100 ×3.5 = 2200 m

(b) Now after taking 3.5 revolutions, the athlete will be its diametrically opposite position. Therefore, displacement, = diameter = 200 m.

Q.2. joseph jogs from one end to the other of a straight 300 m road say from point A to B in 2.50 minutes and then turns around and jogs 100 m to a point C in another 1.00 minute. What are the joseph' s average speed and velocities in jogging : (a) from A to B, and (b) from A to C ?

Ans. Average speed from A to B

= 300m / 2.5 min = 300m / 150s = 2 ms^{-1}

Since path A to B is straight line, so average velocity between A and B is also 2 ms^{-1} .

(b) Average speed from A to C

= Distance AB+ BC / Time taken = 300m + 100m/ 2.5 + 1.00 min

= 400m / 3.5 min = 400m/210s = 1.90 ms^{-1}.

= Average displacement, i.e., A to C / Time taken

= 300m - 100m/ 210s = 200m/210s = 0.952 ms^{-1}

Q.3. Abdul, while driving to school, computes the average speed for his trip to be 20 km h^{-1}. On his return trip along the same route, there is less traffic and the average speed is 40 km h^{-1}. What is the average speed for Abdul's trip ?

Ans. Let the distance from Abdul's home to school = x km .

(a) For going to school average

speed = 20 km h^{-1}

v_{av} = Displacement / time

$20 = x/t_1$

$t_1 = x/20$ h.

(b) For return trip average speed

$$= 40 \text{ km } h^{-1}$$

$$V_{av} = \text{Distance/time}$$

$$40 = x/t_2$$

$$t_2 = x/40 \text{ h}$$

Total distance = x + x = 2x

$$\text{Total time} = x/20 + x/40 + 2x + x / 40 = 3x/40 \text{ h}$$

$$v_{av} = 2x/3x/40 = 2x+40/ 3x$$

$$= 26.67 \text{ km } h^{-1}.$$

Q.4. A motorboat starting from rest on a lake accelerates in a straight line at a constant rate of 3.0 ms^{-2} for 8.0 s. How far does the boat travel during this time?

Ans. Initial velocity (u) = 0

Acceleration = 3.0 ms^{-2}

Time = 8.0 s.

Now distance travelled,

$$S = ut + 1/2\ at^2$$

$$= 0 + 1/2 * 3.0 * (8.0)^2 = 96 \text{ m.}$$

Q.5. A driver of a car travelling at 52 km/h^{-1} applies the brakes and accelerates uniformly in the opposite direction. The car stops in 5s. Another driver going at

3 km/h^{-1} in another car applies his brakes slowly and stops in 10s. On the same graph paper, plot the speed versus time-graph for the two cars. Which of the two cars travelled farther after the brakes were applied?

Ans. AB and CD are the required graphs for two cars. Now, the distance travelled by:

(i) First car = Area of the triangle OAB

= 1/2*Base*Height

= 1/2 *5s*52*1000m/3600s = 36.11m

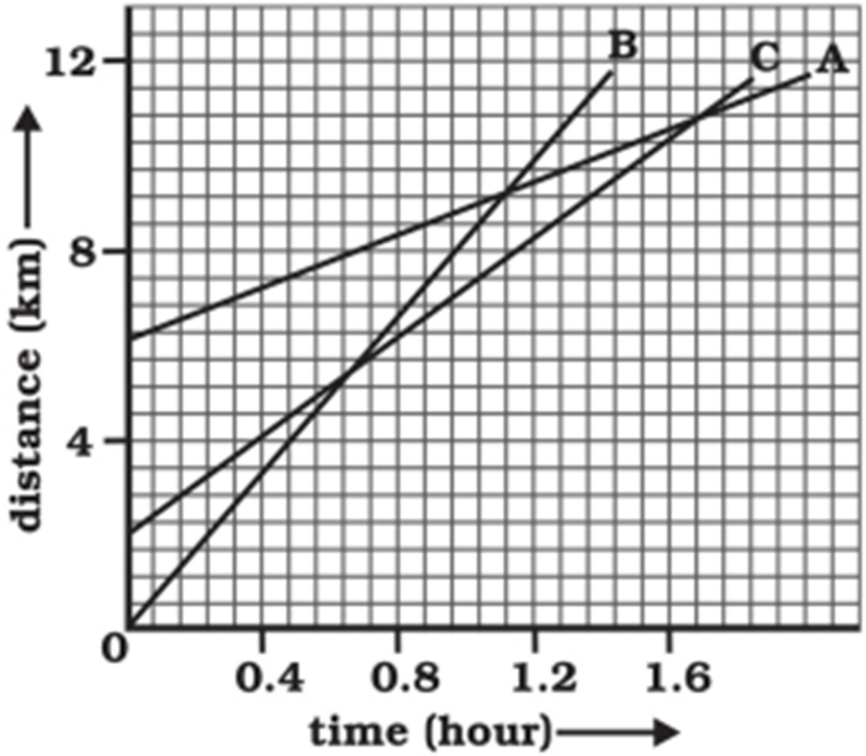
(ii) Second car = Area of triangle OCD

= 1/2*Base*Height

= 1/2 *10s*34*1000m/3600s = 47.2m.

Hence, the second car travelled farther after the application of brakes.

Q.6. The following figure shows the distance-time graph of three objects A, B and C. Study the graph and answer the following questions:



(a) Which of the three is travelling is travelling the fastest?

Ans. Objects B, since the slope of distance-time is highest.

(b) Are all three ever at the same point on the road ?

Ans. Never because the three graphs lines simultaneously do not intersect.

(c) How far has C travelled when B passes A?

Ans. B passes A at F. At the corresponding C is at E, i.e. it is travelled a total distance of 6.6 km. After hour it has travelled a distance of 6.6 - 2 = 4.6 km.

(d) How far did B travel between the time it passes C?

Ans. B passes C at point D. The corresponding distance travelled by B at that time is 5 km.

Q.7. A ball is gently dropped from a height of 20m. If its velocity increases uniformly at the rate of 10 ms^{-2}, with what velocity will it strike the ground ? After what time will it strike the ground?

Ans. Here, u = 0; s = 20m; a = 10 ms^{-2}; v = ?

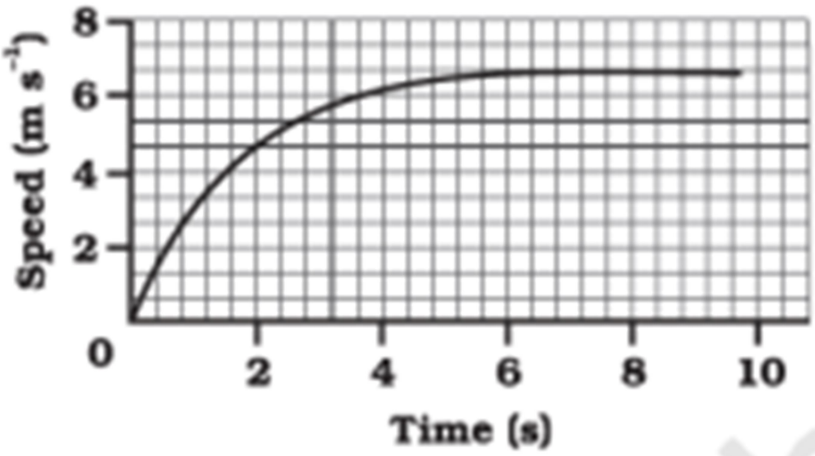
Now,

$$v^2 = u^2 + 2as = o + 2 * 10 * 20$$

$$v^2 = 400 \Rightarrow 20 m/s^{-1}$$

Time taken (t) = v-u/a = 20-0/10 = 2s.

Q.8. The speed-time graph for a car is shown in figure below:



(a) Find how far the car travels in the first 4 seconds. Shade the area on the graph that represents the distance travelled by the car during the period.

Ans. Value of one square = $(2/3 ms^{-1}) * (2/5s) = 4/5m$.

The number of squares bounded between the graph line and x-axis for t = 4 second are around 45.

Therefore, distance = 4/5 * 45 = 12m.

(b) Which part of the graph represents uniform motion of the car?

Ans. Horizontal straight part of graph, AC.

Q.9. State which of the following situations are possible and give an example for each of these:

(a) A body with a constant acceleration but with zero velocity.

Ans. A body is thrown vertically upwards. At the topmost point its velocity is zero but is under a constant acceleration 'g'.

(b) A body is moving in a certain direction with an acceleration in the perpendicular direction.

Ans. It is possible, when an object moves in a uniform circular motion.

Q.10. An artificial satellite is moving in a circular orbit of radius 42,250 km. Calculate its speed if it takes 24 hours to revolve around the earth.

Ans. Speed = 2πr/t = 2 * (22/7) * 42,250 km/24h = 11,065 km/h.

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READ MORE

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