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XI+XII+HSc+CET+JEE(M)+NEET | Commerce(Maths) | ENGINEERING

PHYSICS WORKSHEET : 2D Motion (part 1)

1.	A body travels from A to B at a speed of 10 m/s and back to A (along the same path) at a speed of 15 m/s. Find its average speed for the journey A→B→A. **(Ans.** 12 m/s)
2.	A particle moving with a velocity of 20 m/s is decelerated uniformly at the rate of 1 m/s^2. Find (i) the distance covered by the particle at the end of 10 seconds (ii) the time taken by it to come to rest. **(Ans.** 150 m, 20 s)
3.	A body moving with uniform acceleration along a straight line has a speed of 5 m/s when passing a point P and 15 m/s when passing a point Q in its path. Calculate its speed at the midpoint of PQ. **(Ans.** 11.18 m/s)
4.	A car moving with a uniform velocity of 72 km/h is brought to rest by the application of brakes which retarded the motion at the rate of 8 m/s^2. Determine (1) the time taken by the car to come to a stop (2) the displacement of the car during this time. **(Ans.** 2.5 s, 25 m)

5.	A motorist drives along a straight road at 15 m/s. Just as the car passes a police checkpost, an officer on a parked motorcycle starts off with an acceleration of 2 m/s^2 to overtake the car. Maintaining this constant value of acceleration, find (1) the time it will take the police officer to catch up with the motorist (2) the total displacement of the police officer as he overtakes the motorist. (**Ans.** 7.5 s, 56.25 m)
6.	Two cars, one travelling at 54 km/h and the other at 90 km/h move towards each other along a narrow road. When they are 150 m apart, both the drivers apply the brakes simultaneously. The motion of each car is retarded at 3 m/s^2 and the collision is avoided. Find the distance between the cars when they come to rest. (**Ans.** 8.3 m)

2D Motion (part 2) : Motion under gravity

1.	A stone is thrown straight upward with an initial speed of 12 m/s. Find its displacement and velocity (including direction) after (1) 1 s (2) 2 s. (**Ans.** 7.1 m above the launch point, 2.2 m/s upward; 4.4 m above the launch point, -7.6 m/s downward)
2.	A ball is thrown straight down with an initial speed of 14.7 m/s from the top of a building 49 m high. Find the time it reaches the ground below. (**Ans.** 2 s)
3.	A ball is tossed vertically upward from the roof of a building. It rises 5 m above the roof and then falls vertically downward, striking the ground 15 m below the point launched. (1) Find the initial speed of the ball. (2) Determine the time the ball was in air. [Take $g = 10$ m/s^2] (**Ans.** 10 m/s, 3 s)
4.	A body is released from a tower of height h. Its speed when it reaches the ground is 40 m/s. Find the speed of the body when it was at the height $h/2$ from the ground. (**Ans.** 28.28 m/s)

5.	A body projected vertically upward returns to the starting point after 6 seconds. Find (i) its speed when it returns to the starting point (ii) the total distance covered by the body (iii) the total displacement of the body. [$g = 9.8$ m/s^2] (**Ans.** 29.4 m/s, 88.2 m, zero)
6.	**A body is released from a balloon ascending vertically with a speed of 15 m/s. The body reaches the ground in 14 seconds. Find the height of the balloon at the time the body was released.** (**Ans.** 750.4 m)
7.	**A stone is released from the top of a tower of height 200 m and at the same instant another stone is projected vertically upward along the same line from the base of the tower with a speed of 50 m/s. Find when and where the two stones will meet in air.** (**Ans.** 4 seconds after the start, 121.6 m from the ground.)

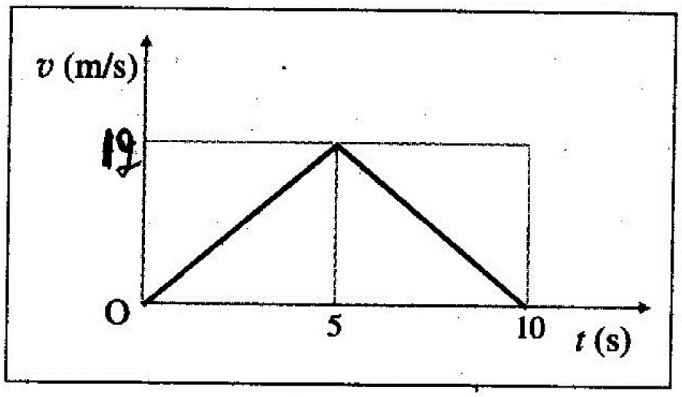
2D Motion (part 3) : Graphical Motion

1. **15.** A car accelerates uniformly from rest to a speed of 12 m/s in 5 s. It then decelerates uniformly to come to rest in the next 5 s.

(i) Draw the velocity-time graph for the motion.

(ii) Calculate (a) the distance travelled in the time interval 0 to 5 s (b) the distance travelled in the time interval 0 to 10 s (c) the average speed for the entire journey.

(**Ans.** (i)



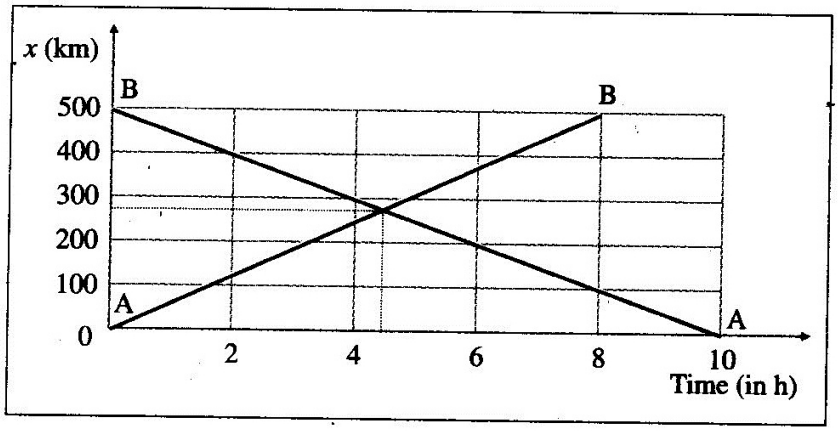
(ii) 30 m, 60 m, 6 m/s)

2. Two cars start at the same instant from two cities A and B which are 500 km apart and travel towards each other at constant speeds. The car starting from A takes 8 h to reach B while the other car starting from B takes 10 h to reach A.

(i) Draw the position-time graphs for the two cars.

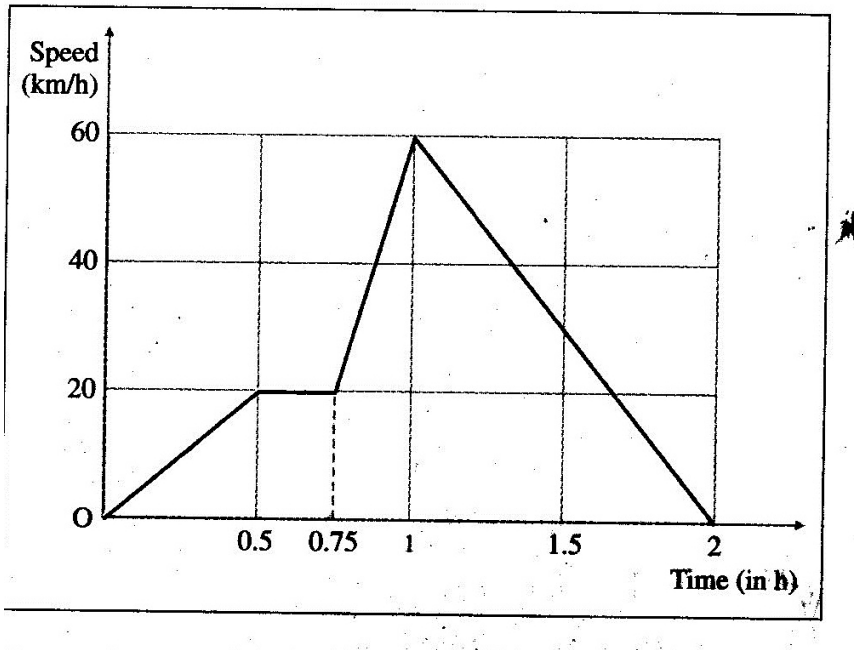
(ii) From the graph, find how far from A and how long after start do they meet.

(Ans. (i)



(ii) Approximately 280 km from A and 4.45 h from commencing their journey.)

3. The velocity-time graph for a particle is shown below.



From the graph, answer the following questions :

(i) What was the maximum speed?

(ii) When was the particle cruising at a constant velocity ?

(iii) When did the particle have maximum acceleration (positive or negative)? Calculate this acceleration.

(iv) When did the particle decelerate ? Calculate this deceleration.

(v) Calculate the distance covered during the time intervals (a) 0 to 1 h (b) 0.75 h to 1 h (c) 1 h to 2 h.

(**Ans.** 60 km/h; 0.5 h to 0.75 h; 0.75 h to 1 h, 160 km/h^2; 1 h to 2 h, 60 km/h^2; 35 m, 25, m, 30 m)
