Additional Problems For Self Practice (APSP)

PART-I : PRACTICE TEST PAPER

Max. Marks : 120 **Max. Time : 1 Hr.**

Important Instructions :

1. The test is of **1 hour** duration and max. marks 120.
2. The test consists **30** questions, **4 marks** each.
3. Only one choice is correct **1 mark** will be deducted for incorrect response. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
4. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 3 above.

1. A stone is dropped from a running bus. It will hit the ground in a-
(1) Straight path (2) Circular path (3) Parabolic path (4) None of these

2. A car A is going North-East at 80 km/hr. and another car B is going South-East at 60 km./hr. Then the direction of the velocity of A relative to B makes with the North and angle α such that tan α is-
(1) $\frac{1}{7}$ (2) $\frac{3}{4}$ (3) $\frac{4}{3}$ (4) $\frac{3}{5}$

3. An aeroplane is flying in a horizontal direction at 600 km/hr at a height of 6 km. and is advancing towards a point which is exactly over a target. At that instant the pilot releases a ball which on descending the earth strikes the target, the falling ball appears-
(1) To the pilot in the aeroplane, as falling along a parabolic path.
(2) To a person standing near the target, as falling exactly vertical.
(3) To a person standing near the target as describing a parabolic path.
(4) To the pilot siting in the aeroplane as falling in a zigzag path.

4. Two trains A & B 100 km apart are travelling towards each other on different tracks with starting speed of 50 km/h for both. The train A accelerates at 20 km/h^2 and the train B retards at the rate 20 km/h^2 . The distance covered by the train A when they cross each other is :
(1) 45 km (2) 55 km (3) 65 km (4) 60 km

5. A ship is travelling due east at 10 km/h. A ship heading 30° east of north is always due north from the first ship. The speed of the second ship in km/h is -
(1) $20\sqrt{2}$ (2) $20\sqrt{3/2}$ (3) 20 (4) $20/\sqrt{2}$

6. A particle A is at rest and particle B moves in a circle with A at it's centre. The particle A will appear:
(1) at rest if seen from B (2) to move in straight line if seen from B
(3) to move in a circle if seen from B (4) to move in parabola if seen from B

7. A flag on a bus is fluttering in north direction & wind is blowing in east direction. Then which of the following will be true
(1) bus is moving in south direction. (2) bus is moving in north east direction.
(3) bus may be moving in any direction between south & east.
(4) bus may be moving in any direction between south & west.

8. A thief is running away on a straight roads on a jeep moving with a speed of 9 m/s. A police man chases him on a motor cycle moving at a speed of 10 m/s. If the instrantaneous separation of jeep from the motor cycle is 100 m, how long will it take for the policemen to catch the thief -
(1) 1 second (2) 19 second (3) 90 second (4) 100 second

9. A boat takes two hours to travel 8 km and back in still water. If the velocity of water is 4 km/h, the time taken for going upstream 8 km and coming back is -
(1) 2h (2) 2h 40 min (3) 1h 20 min
(4) Cannot be estimated with the information given

10. A 120 m long train is moving towards west with a speed of 10 m/s. A bird flying towards east with a speed of 5 m/s crosses the train. The time taken by the bird to cross the train will be -

(1) 16 sec (2) 12 sec (3) 10 sec (4) 8 sec

11. A man can swim with velocity v relative to water. He has to cross a river of width d flowing with a velocity u (u > v). The distance through which he is carried down stream by the river is x. Which of the following statement is correct -

(1) If he crosses the river in minimum time $x = \frac{du}{v}$

(2) x can not be less than $\frac{du}{v}$

(3) For x to be minimum he has to swim in a direction making an angle of $\frac{\pi}{2} - \sin^{-1}\left(\frac{v}{u}\right)$ with the direction of the flow of water

(4) x will be max. if he swims in a direction making an angle of $\frac{\pi}{2} + \sin^{-1}\frac{v}{u}$ with direction of the flow of water

12. Two observers A and B are moving opposite to each other on a parallel track, separated by a distance d, with same speed. When they are at the shortest distance, a particle is thrown horizontally from some height from ground by A towards B with respect to itself. The path of the particle observed by B is –
(1) Horizontal straight line.
(2) Vertical straight line.
(3) Straight line at some angle with the horizontal.
(4) Parabolic.

13. A bus is moving with a velocity 10 ms^{-1} on a straight road. A scooterist wishes to overtake the bus in 100s. If, the bus is at a distance of 1 km from the scooterist, with what velocity should the scooterist chase the bus?
(1) 50 ms^{-1} (2) 40 ms^{-1} (3) 30 ms^{-1} (4) 20 ms^{-1}

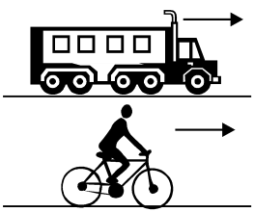
14. A man crosses the river perpendicular to river flow in time t seconds and travels an equal distance down the stream in T seconds. The ratio of man's speed in still water to the speed of river water will be :
(1) $\frac{t^2 - T^2}{t^2 + T^2}$ (2) $\frac{T^2 - t^2}{T^2 + t^2}$ (3) $\frac{t^2 + T^2}{t^2 - T^2}$ (4) $\frac{T^2 + t^2}{T^2 - t^2}$

15. For four particles A, B, C & D, the velocities of one with respect to other are given as $\vec{V}_{DC}$ is 20 m/s towards north, $\vec{V}_{BC}$ is 20 m/s towards east and $\vec{V}_{BA}$ is 20 m/s towards south. Then $\vec{V}_{DA}$ is
(1) 20 m/s towards north (2) 20 m/s towards south
(3) 20 m/s towards east (4) 20 m/s towards west

16. A particle is thrown up inside a stationary lift of sufficient height. The time of flight is T. Now it is thrown again with same initial speed v_0 with respect to lift. At the time of second throw, lift is moving up with speed v_0 and uniform acceleration g upward (the acceleration due to gravity). The new time of flight is–
(1) $\frac{T}{4}$ (2) $\frac{T}{2}$ (3) T (4) 2T

17. Two billiard balls are rolling on a flat table. One has velocity components v_x = 1m/s, $v_y = \sqrt{3}$ m/s and the other has components v_x = 2m/s and v_y = 2 m/s. If both the balls start moving from the same point, the angle between their path is -
(1) 60° (2) 45° (3) 22.5° (4) 15°

18. A cyclist observes a passenger in a bus. He finds that the passenger closed his glass window displacing 20 cm in forward direction with constant speed in 1 sec. Bus overtakes the cyclist in 3 sec. Initially he was at the middle of the bus as shown in the figure. Length of the bus is 18 m. Both cyclist and bus are moving with constant speed in the same direction. Then velocity of the glass window with respect to cyclist was :



(1) 0.2 m/s (2) 2.8 m/s (3) 3.2 m/s (4) 3 m/s

19. A boat is moving towards east with velocity 4 m/s with respect to still water and river is flowing towards north with velocity 2 m/s and the wind is blowing towards north with velocity 6 m/s. The direction of the flag blown over by the wind hoisted on the boat is:

(1) north-west (2) south-east (3) $\tan^{-1}\frac{1}{2}$ with east (4) north

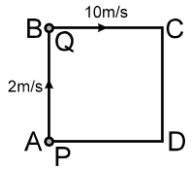
20. Man A is sitting in a car moving with a speed of 54 km/hr observes a man B in front of the car crossing perpendicularly a road of width 15 m in three seconds. Then the velocity of man B (in m/s) will be:

(1) $5\sqrt{10}$ towards the car at some angle (2) $5\sqrt{10}$ away from the car at some angle
(3) 5 perpendicular to the road (4) 15 along the road

21. A man wearing a hat of extended length 12 cm is running in rain falling vertically downwards with speed 10 m/s. The maximum speed with which man can run, so that rain drops do not fall on his face (the length of his face below the extended part of the hat is 16 cm) will be :

(1) 7.5 m/s (2) 13.33 m/s (3) 10 m/s (4) zero

22. Two men P & Q are standing at corners A & B of square ABCD of side 8 m. They start moving along the track with constant speed 2 m/s and 10 m/s respectively. Find the time when they will meet for the first time.



(1) 2 sec (2) 3 sec
(3) 1 sec (4) 6 sec

23. A coin is released inside a lift at a height of 2 m from the floor of the lift. The height of the lift is 10 m. The lift is moving with an acceleration of 9 m/s^2 downwards. The time after which the coin will strike with the lift is : (g = 10 m/s^2)

(1) 4 s (2) 2 s (3) $\frac{4}{\sqrt{21}}$ s (4) $\frac{2}{\sqrt{11}}$ s

24. A man in a balloon, throws a stone downwards with a speed of 5 m/s with respect to balloon . The balloon is moving upwards with a constant acceleration of 5 m/s^2. Then velocity of the stone relative to the man after 2 second is :

(1) 10 m/s (2) 30 m/s
(3) 15 m/s (4) 35 m/s

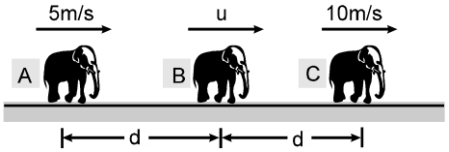
25. A boat is rowing in a river at the rate of 4.8 km/hr with respect to river. The river flows at the rate of 6 km/hr. The speed of boat in m/s can be :

(1) 3.1 (2) 2.1 (3) 4.5 (4) 5

26. Person A observes B moving in east direction with speed 10 m/s, B observes C moving in south direction with speed 20 m/s, C observes D moving in west direction with speed 30 m/s & D observes a tree moving with speed 40 m/s in north direction. Then the actual direction of motion of person 'A' will be

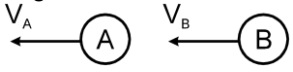
(1) north - west (2) north - east (3) south - east (4) none of these

27. Three elephants A, B and C are moving along a straight line with constant speed in same direction as shown in figure. Speed of A is 5 m/s and speed of C is 10 m/s. Initially separation between A & B is 'd' and between B & C is also d. When 'B' catches 'C' separation between A & C becomes 3d. Then the speed of B will be -



(1) 7.5 m/s (2) 15 m/s (3) 20 m/s (4) 5 m/s

28. Two particles are moving along a straight line as shown . The velocity of approach between A and B is



(1) $V_A + V_B$ (2) $|V_A - V_B|$ (3) $V_A - V_B$ (4) $V_B - V_A$

29. Consider two cases:
(i) A cart moves horizontally with constant velocity and a stone is projected vertically upwards.
(ii) A cart slides down a smooth incline plane and a stone is projected in direction perpendicular to incline.
Stone will fall in the cart :
(1) in both the cases (2) only in case (i) (3) only in case (ii)
(4) as cart is moving in both cases, stone will fall behind the cart in both cases.

30. Rain seems to be falling to a person sitting in a bus moving uniformly eastwards with 10 m/s. It appears to come from vertical and hit the bus windows at a velocity 20 m/s. Find the velocity of rain drops w.r.t. ground.
(1) $5\sqrt{5}$ m/s (2) $\sqrt{5}$ m/s (3) $10\sqrt{5}$ m/s (4) $10\sqrt{10}$ m/s

Practice Test (JEE-Main Pattern)

OBJECTIVE RESPONSE SHEET (ORS)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25	26	27	28	29	30
Ans.										

PART - II : PRACTICE QUESTIONS

1. A river is flowing with a velocity of 1 m/sec toward east direction. When the boat runs with a velocity of 3 m/s relative to the river in the direction of the river flow, the flag on the boat flutter in north direction. If the boat runs with the same speed but in north direction relative the river, the flag flutters towards north-east direction. The actual velocity of the wind (relative to the ground) should be : ($\hat{i}$ = east direction and $\hat{j}$ = north direction)
(1) $4\hat{i}+6\hat{j}$ (2) $6\hat{i}+4\hat{j}$ (3) $4\hat{i}-6\hat{j}$ (4) $6\hat{i}-4\hat{j}$

2. A jet airplane travelling from east to west at a speed of 500 km h^{-1} ejected out gases of combustion at a speed of 1500 km h^{-1} with respect to the jet plane. What is the velocity of the gases with respect to an observer on the ground ?
(1) 1000 km h^{-1} in the direction west to east (2) 1000 km h^{-1} in the direction east to west
(3) 2000 km h^{-1} in the direction west to east (4) 2000 km h^{-1} in the direction east to west

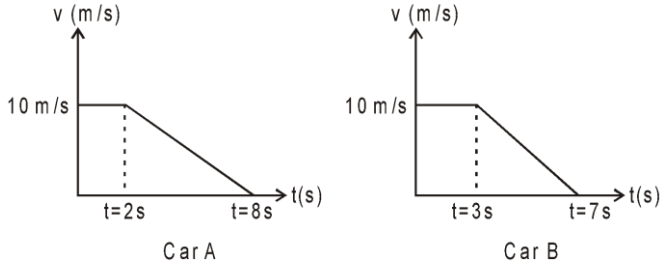
3. Rain is falling vertically with a velocity of 3 kmh^{-1}. A man walks in the rain with a velocity of 4 kmh^{-1}. The rain drops will fall on the man with a velocity of
(1) 5 kmh^{-1} (2) 4 kmh^{-1} (3) 3 kmh^{-1} (4) 1 kmh^{-1}

4. Two boats A and B having same speed relative to river are moving in a river. Boat A moves normal to the river current as observed by an observer moving with velocity of river current. Boat B moves normal to the river as observed by the observer on the ground.
(1) To a ground observer boat B moves faster than A
(2) To a ground observer boat A moves faster than B
(3) To the given moving observer boat B moves faster than A
(4) To the given moving observer boat A moves faster than B

5. A man who can swim at the rate of 2 km/hr (in still river) crosses a river to a point exactly opposite on the other bank by swimming in a direction of 120^0 to the flow of the water in the river. The velocity of the water current in km/hr is
(1) 1 (2) 2 (3) 1/2. (4) 3/2

6. An open elevator is ascending with zero acceleration and speed 10 m/s. A ball is thrown vertically up by a boy when he is at a height 10 m from the ground, the velocity of projection is 30m/s with respect to elevator. Choose incorrect option, assuming height of the boy very small : ($g = 10\ m/s^2$)
(1) Maximum height attained by the ball from ground is 90 m.
(2) Maximum height attained by the ball with respect to lift from the point of projection is 45 m.
(3) Time taken by the ball to meet the elevator again is 5 sec
(4) The speed of the ball when it comes back to the boy is 20 m/s with respect to ground.

7. Car A and car B move on a straight road and their velocity versus time graphs are as shown in figure. Comparing the motion of car A in between t = 0 to t = 8 sec. and motion of car B in between t = 0 to t = 7 sec., pick up the correct statement.



(1) Distance travelled by car A is less than distance travelled by car B.
(2) Distance travelled by car A is greater than distance travelled by car B.
(3) Average speed of both cars are equal.
(4) Average speed of car A is less than average speed of car B.

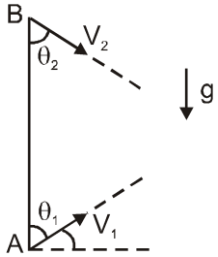
8. Hail stones falling vertically with a speed of $12\sqrt{3}$ m/s hits the wind screen which makes an angle 30º with the horizontal. If car is running at velocity v(in m/s) so that the driver find the hailstones striking perpendicular to the wind screen. Find the value of $\frac{v}{2}$?
(1) 2 m/s (2) 4 m/s (3) 6 m/s (4) 8 m/s

9. A bird is flying towards east with a velocity 40 km/hr and a train is moving with a velocity 40 km/hr towards east. A man in train drops a food packet. The path of food packet as seen by bird till it falls on ground is (ignore air resistance)
(1) parabola (2) circle (3) hyperbola (4) straight line

10. A man is on ship which is moving in east direction with speed 60 km/hr. Waves of ocean is taking ship towards west with speed 20 km/hr. Man start running on ship with flag in his hand in north direction with speed 30 km/hr and wind is blowing with 50 km/hr, 37º towards south of west then find the direction of flutter the flag as seen by man on ground.
(1) 37º south of west (2) 53º south of west (3) 37º west of north (4) flag will not flutter

11. Three particles A,B and C are initially at points $\left(-\frac{3}{2},\ 3,\ 0\right)$, $\left(\frac{3}{2},\ 3,\ 0\right)$ and $\left(0, 3, \frac{3\sqrt{3}}{2}\right)$ respectively. They start their motion at t = 0 with same constant speed 2 m/s. Particle A always heads towards particle B, particle B heads towards particle C and particle C heads towards particle A. At what time will the particles meet each other :
(1) 1 sec. (2) 2 sec. (3) $\frac{3}{2}$ sec. (4) $\frac{1}{2}$ sec.

12. Two balls are projected from points A and B in a vertical plane as shown in figure. AB is a straight vertical line. The balls will collide in mid–air if $\frac{V_1}{V_2}$ is equal to :



(1) $\frac{\sin\theta_2}{\sin\theta_1}$ (2) $\frac{\sin\theta_1}{\sin\theta_2}$
(3) $\frac{\cos\theta_2}{\cos\theta_1}$ (4) $\frac{\cos\theta_1}{\cos\theta_2}$

13. To a stationary man, rain appears to be falling at an angle 30º with the vertical. As he starts moving with a speed of 0.5 m/s he finds that the rain is falling vertically. Then the speed of rain w.r.t. the moving man is :

(1) 0.5 m/s (2) 1 m/s (3) $0.5\sqrt{3}$ m/s (4) $\sqrt{3}$ m/s

Comprehension # 1

The driver of a car travelling at a speed of 20 m/s, wishes to overtake a truck that is moving with a constant speed of 20 m s^{-1} in the same lane. The car's maximum acceleration is 0.5 m s^{-2}. Initially the vehicles are separated by 40 m, and the car returns back into its lane after it is 40 m ahead of the truck. The car is 3 m long and the truck 17 m.

14. Find the minimum time required for the car to pass the truck and return back to its lane?
(1) 10 second (2) 20 second, (3) 15 second (4) none of these.

15. What distance does the car travel during this time?
(1) 500 m (2) 600 m (3) 200 m (4) 300 m

16. What is the final speed of the car ?
(1) 40 m/s (2) 20 m/s (3) 45 m/s (4) 30 m/s

Comprehension # 2

Raindrops are falling with a velocity $10\sqrt{2}$ m/s making an angle of 45^0 with the vertical. The drops appear to be falling vertically to a man running with constant velocity. The velocity of rain drops change such that the rain drops now appear to be falling vertically with $\sqrt{3}$ times the velocity it appeared earlier to the same person running with same velocity.

17. The magnitude of velocity of man with respect to ground is
(1) $10\sqrt{2}$ m/s (2) $10\sqrt{3}$ m/s (3) 20 m/s (4) 10 m/s

18. After the velocity of rain drops change, the magnitude of velocity of raindrops with respect to ground is
(1) 20 m/s (2) $20\sqrt{3}$ m/s (3) 10 m/s (4) $10\sqrt{3}$ m/s

19. The angle (in degrees) between the initial and the final velocity vectors of the raindrops with respect to the ground is
(1) 8 (2) 15 (3) 22.5 (4) 37

Answers

PART-I

1.	(3)	**2.**	(1)	**3.**	(3)	**4.**	(4)	**5.**	(3)	**6.**	(3)	**7.**	(3)
8.	(4)	**9.**	(2)	**10.**	(4)	**11.**	(1)	**12.**	(4)	**13.**	(4)	**14.**	(3)
15.	(4)	**16.**	(2)	**17.**	(4)	**18.**	(1)	**19.**	(1)	**20.**	(2)	**21.**	(1)
22.	(2)	**23.**	(2)	**24.**	(4)	**25.**	(2)	**26.**	(3)	**27.**	(2)	**28.**	(4)
29.	(1)	**30.**	(3)										

PART-II

1.	(1)	**2.**	(1)	**3.**	(1)	**4.**	(2)	**5.**	(1)	**6.**	(3)	**7.**	(4)
8.	(3)	**9.**	(4)	**10.**	(1)	**11.**	(1)	**12.**	(1)	**13.**	(3)	**14.**	(2)
15.	(1)	**16.**	(4)	**17.**	(4)	**18.**	(1)	**19.**	(2)				