IITIAN'S SPECTRUM
IIT JEE/NEET FOUNDATION

IITIAN'S SPECTRUM
Prudent Minds, Promising Path

Founder-Director
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B.Tech (IIT)

PHYSICS

DPS-2
DAILY PRACTICE SHEET

Class XI

Kinematics

INSTRUCTIONS

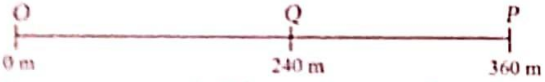
- DPS contains 45 topicwise questions and 5 exam section questions.
- Each question has four options out of which only one option is correct.
- Mark the correct answer in the OMR Sheet given at the end of the DPS.
- Each question carries 4 marks.
- For every incorrect answer deduct 1 mark.

Time : 50 minutes
Marks : 200

Date: _____

Motion in a Straight Line

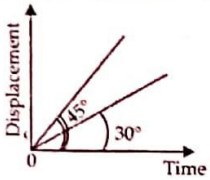
1. A car is moving along a straight line OP as shown in the figure. It moves from O to P in 18 s and returns from P to Q in 6 s. The car takes same time in going from O to P and come back to O. Which of the following statements is not correct regarding the motion of the car?



(a) The average speed of the car in going from O to P and come back to Q is 20 m s^{-1}.
(b) The average velocity of the car in going from O to P and come back to Q is 10 m s^{-1}.
(c) The average speed of the car in going from O to P and come back to O is 20 m s^{-1}.
(d) The average velocity of the car in going from O to P and come back to O is 20 m s^{-1}.

2. A motorboat covers the distance between two spots on the river in 8 h and 12 h downstream and upstream respectively. The time required by the boat to cover this distance in still water is
(a) 6.3 h (b) 9.6 h (c) 3.2 h (d) 18.12 h

3. The displacement-time graphs of two moving particles make angles of 30° and 45° with the time-axis. The ratio of their velocities is
(a) $\sqrt{3}:2$
(b) $1:1$
(c) $1:2$
(d) $1:\sqrt{3}$

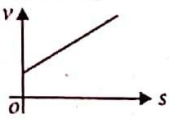


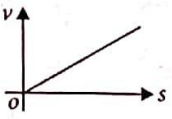
4. A body of mass m moving along a straight line covers half the distance with a speed of 2 m s^{-1}. The remaining half of the distance is covered in two equal time intervals with a speed of 3 m s^{-1} and 5 m s^{-1} respectively. The average speed of the particle for the entire journey is
(a) $\frac{3}{8}$ m s^{-1} (b) $\frac{8}{3}$ m s^{-1}
(c) $\frac{4}{3}$ m s^{-1} (d) $\frac{16}{3}$ m s^{-1}

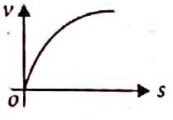
5. The velocity of the particle at any time t is given by $v = 2t(3 - t)$ m s^{-1}.
At what time is its velocity maximum?
(a) 2 s (b) 3 s (c) $\frac{2}{3}$ s (d) $\frac{3}{2}$ s

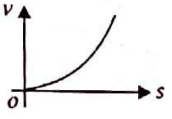
Kinematic Equations for Uniformly Accelerated Motion

6. A body starting from rest moves along a straight line with a constant acceleration. The variation of speed (v) with distance (s) is given by

(a) 

(b) 

(c) 

(d) 

7. A particle moving with uniform acceleration has average velocities v_1, v_2 and v_3 over the successive intervals of time t_1, t_2 and t_3 respectively. The value of $\frac{(v_1 - v_2)}{(v_2 - v_3)}$ will be
(a) $\frac{t_1 - t_2}{t_2 - t_3}$ (b) $\frac{t_1 - t_2}{t_2 + t_3}$

(c) $\frac{t_1+t_2}{t_2-t_3}$ (d) $\frac{t_1+t_2}{t_2+t_3}$

8. Which of the following relations representing displacement $x(t)$ of a particle describes motion with constant acceleration?
(a) $x = 6 - 7t^{-2}$ (b) $x = 3t^2 + 5t^3 + 7$
(c) $x = 9t^2 + 8$ (d) $x = 4t^{-2} + 3t^{-1}$

9. A person throws balls into air vertically upward in regular intervals of time of one second. The next ball is thrown when the velocity of the ball thrown earlier becomes zero. The height to which the balls rise is (Assume, $g = 10\ m\ s^{-2}$)
(a) 5 m (b) 10 m (c) 7.5 m (d) 20 m

10. A body A is thrown up vertically from the ground with a velocity v_0 and another body B is simultaneously dropped from a height H. They meet at a height $\frac{H}{2}$ if v_0 is equal to
(a) $\sqrt{2gH}$ (b) $\sqrt{gH}$
(c) $\frac{1}{2}\sqrt{gH}$ (d) $\sqrt{\frac{2g}{H}}$

11. A ball is dropped from a high rise platform at $t = 0$ starting from rest. After 6 seconds another ball is thrown downwards from the same platform with a speed v. The two balls meet at $t = 18$ s. What is the value of v? (Take $g = 10\ m/s^2$)
(a) 75 m/s (b) 55 m/s (c) 40 m/s (d) 60 m/s

12. A body dropped from top of a tower fall through 40 m during the last two seconds of its fall. The height of tower is ($g = 10\ m/s^2$)
(a) 60 m (b) 45 m (c) 80 m (d) 50 m.

13. A ball falls from height h. After 1 second, another ball falls freely from a point 20 m below the point from where the first ball falls. Both of them reach the ground at the same time. What is the value of h? (Take $g = 10\ m\ s^{-2}$)
(a) 11.2 m (b) 21.2 m (c) 31.2 m (d) 41.2 m

14. A car is moving along a straight road with a uniform acceleration. It passes through two points P and Q separated by a distance with velocity 30 km/h and 40 km/h respectively. The velocity of the car midway between P and Q is
(a) $33\sqrt{5}$ km/h (b) $20\sqrt{2}$ km/h
(c) $25\sqrt{2}$ km/h (d) 35 km/h.

15. A 130 m long train is moving in up direction with speed 72 km/h. Another train of 120 m long is moving in down direction with speed of 108 km/h. The time in which second train crosses the first train will be
(a) 5 s (b) 10 s (c) 12 s (d) 15 s

16. A bird is tossing (flying to and fro) between two cars moving towards each other on a straight road. One car has speed of 27 km h^{-1} while the other has the speed of 18 km h^{-1}. The bird starts moving from first car towards the other and is moving with the speed of 36 km h^{-1} when the two cars were separated by 36 km. The total distance covered by the bird is
(a) 28.8 km (b) 38.8 km
(c) 48.8 km (d) 58.8 km

17. On a two-lane road, car A is travelling with a speed of 36 km h^{-1}. Two cars B and C approach car A in opposite directions with a speed of 54 km h^{-1} each. At a certain instant, when the distance AB is equal to AC, both being 1 km, B decides to overtake A before C does. The minimum required acceleration of car B to avoid an accident is
(a) $1\ m\ s^{-2}$ (b) $1.5\ m\ s^{-2}$
(c) $2\ m\ s^{-2}$ (d) $3\ m\ s^{-2}$

Motion in a Plane

18. A body is moving with velocity 30 m/s towards east. After 10 seconds its velocity becomes 40 m/s towards north. The average acceleration of the body is
(a) $1\ m/s^2$ (b) $7\ m/s^2$
(c) $\sqrt{7}\ m/s^2$ (d) $5\ m/s^2$

19. Three persons are initially at the 3 corners of an equilateral triangle whose side is equal to d. Each person now moves with a uniform speed v in such a way that the first moves directly towards the second and second directly towards the third and third directly towards the first. 3 persons will meet after a time equal to
(a) $\frac{d}{v}$ (b) $\frac{2d}{3v}$ (c) $\frac{2d}{v\sqrt{3}}$ (d) $\frac{d}{v\sqrt{3}}$

20. Two cars A and B start moving from the same point with same velocity $v = 5$ km/minute. Car A moves towards north and car B is moving towards east. What is the relative velocity of B with respect to A ?
(a) $5\sqrt{2}$ km/min towards south-east
(b) 5 km/min towards north-west
(c) $5\sqrt{2}$ km/min towards south-west
(d) 10 km/min towards north-east

21. Two vectors $\vec{A}$ and $\vec{B}$ inclined at an angle have a resultant $\vec{R}$ which makes an angle α with $\vec{A}$ and angle β with $\vec{B}$. Let the magnitudes of the vectors $\vec{A}$, $\vec{B}$ and $\vec{R}$ be represented by A, B and R respectively. Which of the following relations is not correct?
(a) $\frac{R}{\sin(\alpha+\beta)} = \frac{A}{\sin\alpha} = \frac{B}{\sin\beta}$
(b) $R\sin\alpha = B\sin(\alpha+\beta)$
(c) $A\sin\alpha = B\sin\beta$ (d) $R\sin\beta = A\sin(\alpha+\beta)$

22. Vectors $\vec{A}$ and $\vec{B}$ include an angle θ between them. If $(\vec{A}+\vec{B})$ and $(\vec{A}-\vec{B})$ respectively subtend angles α and β with $\vec{A}$, then $(\tan\alpha + \tan\beta)$ is
(a) $\frac{(AB\sin\theta)}{(A^2+B^2\cos^2\theta)}$ (b) $\frac{(2AB\sin\theta)}{(A^2-B^2\cos^2\theta)}$
(c) $\frac{(A^2\sin^2\theta)}{(A^2+B^2\cos^2\theta)}$ (d) $\frac{(B^2\sin^2\theta)}{(A^2-B^2\cos^2\theta)}$

23. A girl riding a bicycle with a speed of 5 m s^{-1} towards north direction, observes rain falling vertically down. If she increases her speed to 10 m s^{-1}, rain appears to meet her at 45° to the vertical. What is the speed of the rain?
(a) $5\sqrt{2}\ m\ s^{-1}$ (b) $5\ m\ s^{-1}$
(c) $10\sqrt{2}\ m\ s^{-1}$ (d) $10\ m\ s^{-1}$

24. A bus is moving on a straight road towards north with a uniform speed of 50 km/h then it turns left through 90°. If the speed remains unchanged after turning, the increase in the velocity of bus in the turning process is
(a) 70.7 km/h along south-west direction
(b) zero
(c) 50 km/h along west direction
(d) 70.7 km/h along north-west direction

25. A boat is sent across a river with a velocity of 8 km h^{-1}. If the resultant velocity of boat is 10 km h^{-1}, then velocity of river is
(a) 12.8 km h^{-1} (b) 6 km h^{-1}
(c) 8 km h^{-1} (d) 10 km h^{-1}

26. The resultant of two vectors P and Q is R. If the magnitude of Q is doubled, the new resultant becomes perpendicular to P. Then the magnitude of R is
(a) $P+Q$ (b) Q (c) P (d) $\frac{P+Q}{2}$

27. A particle crossing the origin of co-ordinates at time $t = 0$, moves in the x-y plane with a constant acceleration a in the y-direction. If its equation of motion is $y = bx^2$ (b is a constant), its velocity component in the x-direction is
(a) $\sqrt{\frac{b}{2a}}$ (b) $\sqrt{\frac{a}{2b}}$ (c) $\sqrt{\frac{a}{b}}$ (d) $\sqrt{\frac{b}{a}}$

28. Given $\vec{A}+\vec{B}+\vec{C}+\vec{D}=\vec{0}$, which of the following statements is not correct?
(a) $\vec{A}$, $\vec{B}$, $\vec{C}$ and $\vec{D}$ must each be a null vector.
(b) The magnitude of $(\vec{A}+\vec{C})$ equals the magnitude of $(\vec{B}+\vec{D})$.
(c) The magnitude of $\vec{A}$ can never be greater than the sum of the magnitudes of $\vec{B}$, $\vec{C}$ and $\vec{D}$.
(d) $\vec{B}+\vec{C}$ must lie in the plane of $\vec{A}$ and $\vec{D}$ if $\vec{A}$ and $\vec{D}$ are not collinear and in the line of $\vec{A}$ and $\vec{D}$, if they are collinear.

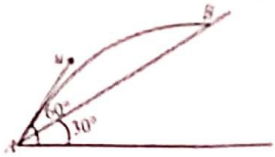
Projectile Motion

29. A fighter plane is flying horizontally at an altitude of 1.5 km with speed 720 km h^{-1}. At what angle of sight (w.r.t. horizontal) when the target is seen, should the pilot drop the bomb in order to attack the target? (Take g = 10 m s^{-2})
(a) 23° (b) 32° (c) 12° (d) 42°

30. A cricketer can throw a ball to a maximum horizontal distance of 100 m. With the same speed how much high above the ground can the cricketer throw the same ball?
(a) 50 m (b) 100 m (c) 150 m (d) 200 m

31. When the angle of projection is 75°, a ball falls 10 m short of the target. When the angle of projection is 45°, it falls 10 m ahead of the target. Both are projected from the same point with the same speed in the same direction, the distance of the target from the point of projection is
(a) 15 m (b) 30 m (c) 45 m (d) 10 m

32. Time taken by the projectile to reach from A to B is t, then the distance AB is equal to
(a) $2ut$
(b) $\sqrt{3}\,ut$
(c) $\frac{\sqrt{3}}{2}ut$
(d) $\frac{ut}{\sqrt{3}}$



33. The speed of a projectile when it is at its greatest height is $\sqrt{2/5}$ times its speed at half the maximum height. What is its angle of projection?
(a) 30° (b) 60° (c) 45° (d) 0°

34. The horizontal range and the maximum height of a projectile are equal. The angle of projection of the projectile is
(a) $\theta = \tan^{-1}\left(\frac{1}{4}\right)$ (b) $\theta = \tan^{-1}(4)$
(c) $\theta = \tan^{-1}(2)$ (d) $\theta = 45°$

35. The equations of motion of a projectile are given by $x = 36t$ m and $2y = 96t - 9.8t^2$ m. The angle of projection is
(a) $\sin^{-1}\left(\frac{4}{5}\right)$ (b) $\sin^{-1}\left(\frac{3}{5}\right)$
(c) $\sin^{-1}\left(\frac{4}{3}\right)$ (d) $\sin^{-1}\left(\frac{3}{4}\right)$

36. The ceiling of a hall is 40 m high. For maximum horizontal distance, the angle at which the ball may be thrown with a speed of 56 m s^{-1} without hitting the ceiling of the hall is
(a) 25° (b) 30° (c) 45° (d) 60°

37. The speed of a projectile at its maximum height is $\frac{\sqrt{3}}{2}$ times its initial speed. If the range of the projectile is P times the maximum height attained by it, then P equals
(a) $\frac{4}{3}$ (b) $2\sqrt{3}$ (c) $4\sqrt{3}$ (d) $\frac{3}{4}$

38. A projectile is fired at an angle of 45° with the horizontal. Elevation angle of the projectile at its highest point as seen from the point of projection, is
(a) 45° (b) 60°
(c) $\tan^{-1}\left(\frac{1}{2}\right)$ (d) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

39. What is the relationship between time of flight T and horizontal range R?
(where θ is angle of projection with the horizontal)
(a) $R = \frac{gT}{\tan\theta}$ (b) $R = \frac{gT^2}{2\tan\theta}$
(c) $R = \frac{gT^2}{\tan\theta}$ (d) $R = \frac{gT}{2\tan\theta}$

40. The maximum horizontal range of projectile is 400 m. The maximum height attained by it will be
(a) 100 m (b) 200 m (c) 400 m (d) 800 m

Uniform Circular Motion

41. A cyclist is riding with a speed of 27 km h^{-1}. As he approaches a circular turn on the road of radius 80 m, he applies brakes and reduces his speed at the constant rate of 0.50 m s^{-1} every second. The net acceleration of the cyclist on the circular turn is

(a) 0.68 m s^{-2} (b) 0.86 m s^{-2}

(c) 0.56 m s^{-2} (d) 0.76 m s^{-2}

42. A cyclist starts from the centre O of a circular park of radius 1 km, reaches the edge P of the park, then cycles along the circumference and returns to the centre along QO as shown in the figure.

If the round trip takes ten minutes, the net displacement and average speed of the cyclist (in metre and kilometre per hour) is

(a) 0, 1 (b) $\frac{\pi+4}{2}$, 0

(c) 21.4, $\frac{\pi+4}{2}$ (d) 0, 21.4

43. What is approximately the centripetal acceleration (in units of acceleration due to gravity on earth, $g = 10$ m s^{-2}) of an air-craft flying at a speed of 400 m s^{-1} through a circular arc of radius 0.6 km ?

(a) 26.7 (b) 16.9 (c) 13.5 (d) 30.2

44. A particle moves with a uniform speed v and time period T in a circular path of radius r. If the speed of the particle is doubled, its new time period is

(a) T (b) $\frac{T}{2}$ (c) $2T$ (d) $\frac{T}{4}$

45. The ratio of angular speed of a second-hand to the hour-hand of a watch is

(a) 60 : 1 (b) 72 : 1 (c) 720 : 1 (d) 3600 : 1

EXAM SECTION

46. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_P(t) = (at + bt^2)$ and $x_Q(t) = (ft - t^2)$. At what time do the cars have the same velocity ?

(a) $\frac{a-f}{1+b}$ (b) $\frac{a+f}{2(b-1)}$

(c) $\frac{a+f}{2(1+b)}$ (d) $\frac{f-a}{2(1+b)}$ *(NEET Phase II 2016)*

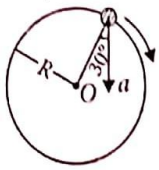
47. In the given figure, $a = 15$ m s^{-2} represents the total acceleration of a particle moving in the clockwise direction in a circle of radius $R = 2.5$ m at a given instant of time. The speed of the particle is

(a) 4.5 m s^{-1}

(b) 5.0 m s^{-1}

(c) 5.7 m s^{-1}

(d) 6.2 m s^{-1}



(NEET Phase I 2016)

48. If the velocity of a particle is $v = At + Bt^2$, where A and B are constants, then the distance travelled by it between 1 s and 2 s is

(a) $\frac{3}{2}A + \frac{7}{3}B$ (b) $\frac{A}{2} + \frac{B}{3}$

(c) $\frac{3}{2}A + 4B$ (d) $3A + 7B$ *(NEET Phase I 2016)*

49. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is

(a) 45° (b) 180° (c) 0° (d) 90°

(NEET Phase I 2016)

50. If vectors $\vec{A} = \cos\omega t\,\hat{i} + \sin\omega t\,\hat{j}$ and $\vec{B} = \cos\frac{\omega t}{2}\,\hat{i} + \sin\frac{\omega t}{2}\,\hat{j}$ are functions of time, then the value of t at which they are orthogonal to each other is

(a) $t = \frac{\pi}{\omega}$ (b) $t = 0$

(c) $t = \frac{\pi}{4\omega}$ (d) $t = \frac{\pi}{2\omega}$ *(AIPMT 2015)*

OMR SHEET

Use HB pencil only and darken each circle completely.
Mark only one choice for each question as indicated.

Correct marking ● ⓑ ⓒ ⓓ
Wrong marking ⊗ ⓐ ◑ ⊙

1. ⓐ ⓑ ⓒ ⓓ	7. ⓐ ⓑ ⓒ ⓓ	13. ⓐ ⓑ ⓒ ⓓ	19. ⓐ ⓑ ⓒ ⓓ	25. ⓐ ⓑ ⓒ ⓓ	31. ⓐ ⓑ ⓒ ⓓ	37. ⓐ ⓑ ⓒ ⓓ	43. ⓐ ⓑ ⓒ ⓓ	49. ⓐ ⓑ ⓒ ⓓ
2. ⓐ ⓑ ⓒ ⓓ	8. ⓐ ⓑ ⓒ ⓓ	14. ⓐ ⓑ ⓒ ⓓ	20. ⓐ ⓑ ⓒ ⓓ	26. ⓐ ⓑ ⓒ ⓓ	32. ⓐ ⓑ ⓒ ⓓ	38. ⓐ ⓑ ⓒ ⓓ	44. ⓐ ⓑ ⓒ ⓓ	50. ⓐ ⓑ ⓒ ⓓ
3. ⓐ ⓑ ⓒ ⓓ	9. ⓐ ⓑ ⓒ ⓓ	15. ⓐ ⓑ ⓒ ⓓ	21. ⓐ ⓑ ⓒ ⓓ	27. ⓐ ⓑ ⓒ ⓓ	33. ⓐ ⓑ ⓒ ⓓ	39. ⓐ ⓑ ⓒ ⓓ	45. ⓐ ⓑ ⓒ ⓓ	
4. ⓐ ⓑ ⓒ ⓓ	10. ⓐ ⓑ ⓒ ⓓ	16. ⓐ ⓑ ⓒ ⓓ	22. ⓐ ⓑ ⓒ ⓓ	28. ⓐ ⓑ ⓒ ⓓ	34. ⓐ ⓑ ⓒ ⓓ	40. ⓐ ⓑ ⓒ ⓓ	46. ⓐ ⓑ ⓒ ⓓ	
5. ⓐ ⓑ ⓒ ⓓ	11. ⓐ ⓑ ⓒ ⓓ	17. ⓐ ⓑ ⓒ ⓓ	23. ⓐ ⓑ ⓒ ⓓ	29. ⓐ ⓑ ⓒ ⓓ	35. ⓐ ⓑ ⓒ ⓓ	41. ⓐ ⓑ ⓒ ⓓ	47. ⓐ ⓑ ⓒ ⓓ	
6. ⓐ ⓑ ⓒ ⓓ	12. ⓐ ⓑ ⓒ ⓓ	18. ⓐ ⓑ ⓒ ⓓ	24. ⓐ ⓑ ⓒ ⓓ	30. ⓐ ⓑ ⓒ ⓓ	36. ⓐ ⓑ ⓒ ⓓ	42. ⓐ ⓑ ⓒ ⓓ	48. ⓐ ⓑ ⓒ ⓓ	

SELF CHECK

No. of questions attempted .....

No. of questions correct .....

Marks scored in percentage .....

Check your score! If your score is

> 90%	EXCELLENT WORK !	You are well prepared to take the challenge of final exam.
90-75%	GOOD WORK !	You can score good in the final exam.
74-60%	SATISFACTORY !	You need to score more next time
< 60%	NOT SATISFACTORY!	Revise thoroughly and strengthen your concepts.