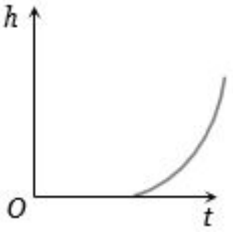
Jupiter Academy

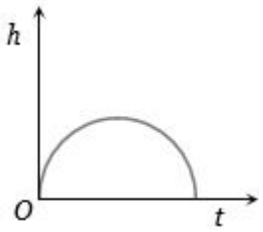
Subjects : Physics **PRACTICE PAPER 02**

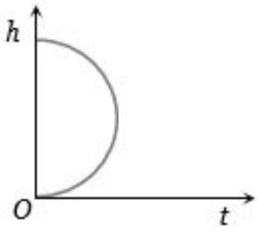
Total Marks : 180

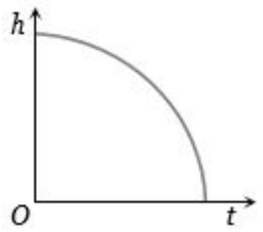
Physics - Section A (MCQ)

1. Which of the following is the altitude-time graph for a projectile thrown horizontally from the top of the tower

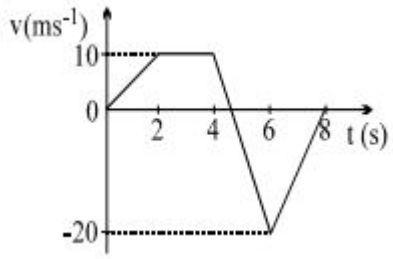
A) 

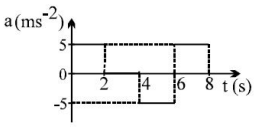
B) 

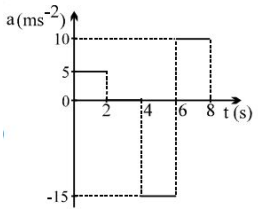
C) 

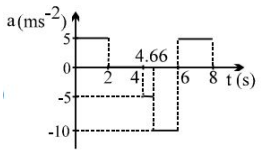
D) 

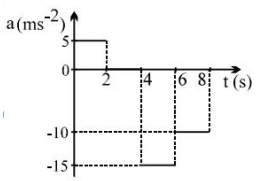
2. The figure shows a velocity-time graph of a particle moving along a straight line The correct acceleration-time graph of the particle is shown as



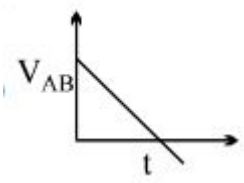
A) 

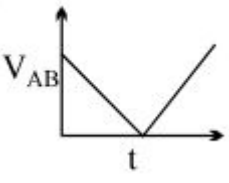
B) 

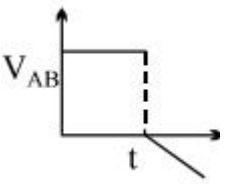
C) 

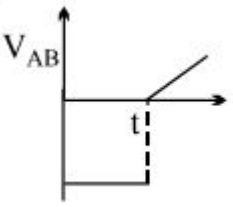
D) 

3. A body A is thrown vertically upwards with such a velocity that it reaches a maximum height of h. Simultaneously another body B is dropped from height h. It strikes the ground and does not rebound. The velocity of A relative to Bv/s time graph is best represented by : (upward direction is positive)

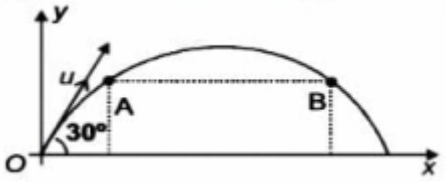
A) 

B) 

C) 

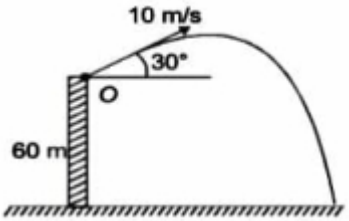
D) 

4. A particle is thrown with a velocity of $u\ m/s$. It passes A and B as shown in figure at time $t_1 = 1\ s$ and $t_2 = 3\ s$. The value of u is ..... m/s $(g = 10\,m/s^2)$



A) 20 B) 10 C) 40 D) 5

5. A ball is projected from a point O as shown in figure. It will strike the ground after ..... s $(g = 10\,m/s^2)$



A) 4 B) 3 C) 2 D) 5

6. Two particles A and B start moving with velocities $20\,m/s$ and $30\sqrt{2}\,m/s$ along x-axis and at an angle 45° with x-axis respectively in xy-plane from origin. The relative velocity of B w.r.t. A is ..... m/s

A) $(10\hat{i} + 30\hat{j})$ B) $(30\hat{i} + 10\hat{j})$
C) $(30\hat{i} - 20\sqrt{2}\hat{j})$ D) $(30\sqrt{2}\hat{i} + 10\sqrt{2}\hat{j})$

7. The initial position of an object at rest is given by $3\hat{i} - 8\hat{j}$ It moves with constant acceleration and reaches to the position $2\hat{i} + 4\hat{j}$ after $4\ s$. What is its acceleration?

A) $-\frac{1}{8}\hat{i} + \frac{3}{2}\hat{j}$
B) $2\hat{i} - \frac{1}{8}\hat{j}$
C) $-\frac{1}{2}\hat{i} + 8\hat{j}$

D) $8\hat{i} - \frac{3}{2}\hat{j}$

8. A particle is moving on a circular path of radius r with uniform speed v. What is the displacement of the particle after it has described an angle of 60^o ?

A) $r\sqrt{2}$ **B)** $r\sqrt{3}$ **C)** r **D)** $2r$

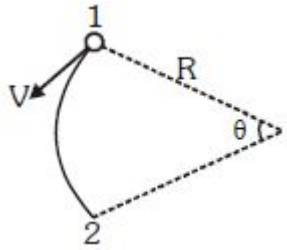
9. A particle moves in a circular path of radius r with speed v. It then increases its speed to $2\,v$ while travelling along the same circular path. The centripetal acceleration of the particle has changed by a factor of

A) 0.25 **B)** 0.5 **C)** 2 **D)** 4

10. Two projectiles, one fired from surface of earth with velocity $10\ m/s$ and other fired from the surface of another planet with initial speed $5\ m/s$ trace identical trajectories. The value of acceleration due to the gravity on the planet is ..... m/s^2

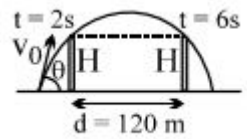
A) 2.5 **B)** 3.6 **C)** 4.9 **D)** 6.4

11. A ring of mass m moves from point 1 to point 2 along a smooth rigid horizontal wire with a constant speed v. The average force acting the ring over the time of its motion from 1 to 2 is



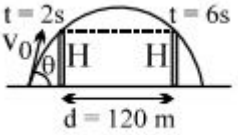
A) $\frac{2mv^2}{R}\sin\theta$
B) $\frac{mv^2}{R}$
C) $\frac{2mv^2\ \sin\frac{\theta}{2}}{R\theta}$
D) None of these

12. A projectile crosses two walls of equal height H symmetrically as shown The velocity of projection is..... ms^{-1}



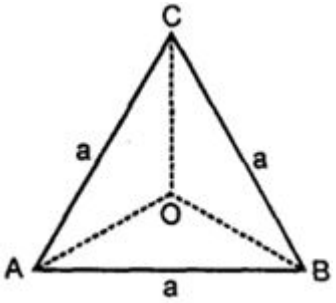
A) 30 **B)** 40
C) 50 **D)** none of these

13. A projectile crosses two walls of equal height H symmetrically as shown The maximum height of the projectile is ..... m



A) 120 **B)** 80
C) 160 **D)** cannot be obtained

14. ABC is an equilateral triangle. Length of each side is a and centroid is point O. then $\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC} =$ .....



A) 0 **B)** 1 **C)** 2 **D)** 3

15. A body is moving under the action of two forces $\vec{F}_1 = 2\hat{i} - 5\hat{j}$; $\vec{F}_2 = 3\hat{i} - 4\hat{j}$. Its velocity will become uniform under an additional third force $\vec{F}_3$ given by

A) $5\hat{i} - \hat{j}$ **B)** $-5\hat{i} - \hat{j}$
C) $5\hat{i} + \hat{j}$ **D)** $-5\hat{i} + 9\hat{j}$

16. If $\overrightarrow{A} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\overrightarrow{B} = -\hat{i} + 3\hat{j} + 4\hat{k}$ a unit vector perpendicular to both $\overrightarrow{A}$ and $\overrightarrow{B}$ will be

A) $+\frac{1}{\sqrt{3}}(\hat{i} - \hat{j} - \hat{k})$ **B)** $-\frac{1}{\sqrt{3}}(\hat{i} - \hat{j} - \hat{k})$
C) Both (a) and (b) **D)** None of these

17. Given that $\overrightarrow{A} + \overrightarrow{B} + \overrightarrow{C} = 0$ out of three vectors two are equal in magnitude and the magnitude of third vector is $\sqrt{2}$ times that of either of the two having equal magnitude. Then the angles between vectors are given by

A) $30°, 60°, 90°$
B) $45°, 45°, 90°$
C) $45°, 60°, 90°$
D) $90°, 135°, 135°$

18. The resultant of two forces, one double the other in magnitude, is perpendicular to the smaller of the two forces. The angle between the two forces is ..... ^{o}

A) 60 **B)** 120 **C)** 150 **D)** 90

19. What is the unit vector perpendicular to the following vectors $2\hat{i}+2\hat{j}-\hat{k}$ and $6\hat{i}-3\hat{j}+2\hat{k}$

A) $\frac{\hat{i}+10\hat{j}-18\hat{k}}{5\sqrt{17}}$
B) $\frac{\hat{i}-10\hat{j}+18\hat{k}}{5\sqrt{17}}$
C) $\frac{\hat{i}-10\hat{j}-18\hat{k}}{5\sqrt{17}}$
D) $\frac{\hat{i}+10\hat{j}+18\hat{k}}{5\sqrt{17}}$

20. A person goes $10\,km$ north and $20\,km$ east. What will be displacement from initial point.....km

A) 22.36 **B)** 2 **C)** 5 **D)** 20

21. Which one of the following pair cannot be the rectangular components of force vector of $10\,N$?

A) $6\,N$ and $8\,N$
B) $7\,N$ and $\sqrt{51}\,N$
C) $6\sqrt{2}\,N$ and $2\sqrt{7}\,N$
D) $9\,N$ and $1\,N$

22. The sum of three forces $\vec{F}_1 = 100\ N, \vec{F}_2 = 80\ N$ and $\vec{F}_3 = 60\ N$ acting on a particle is zero. The angle between $\vec{F}_1$ and $\vec{F}_2$ is nearly ..... ^{o}

A) 53 **B)** 143 **C)** 37 **D)** 127

23. The resultant of two forces $3P$ and $2P$ is R. If the first force is doubled then the resultant is also doubled. The angle between the two forces is ..... ^{o}

A) 60 **B)** 120 **C)** 70 **D)** 180

24. The angle between vectors $(\vec{A} \times \vec{B})$ and $(\vec{B} \times \vec{A})$ is

A) Zero **B)** π **C)** $\pi/4$ **D)** $\pi/2$

25. If for two vectors $\vec{A}$ and $\vec{B}$, $\vec{A} \times \vec{B} = 0$, the vectors

A) Are perpendicular to each other
B) Are parallel to each other
C) Act at an angle of $60°$
D) Act at an angle of $30°$

26. The angle between two vectors $-2\hat{i}+3\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}-4\hat{k}$ is ..... ^{o}

A) 0 **B)** 90
C) 180 **D)** None of the above

27. If $\vec{A} = 2\hat{i}+4\hat{j}-5\hat{k}$ the direction of cosines of the vector $\vec{A}$ are

A) $\frac{2}{\sqrt{45}}, \frac{4}{\sqrt{45}}$ and $\frac{-5}{\sqrt{45}}$
B) $\frac{1}{\sqrt{45}}, \frac{2}{\sqrt{45}}$ and $\frac{3}{\sqrt{45}}$
C) $\frac{4}{\sqrt{45}}, 0$ and $\frac{4}{\sqrt{45}}$
D) $\frac{3}{\sqrt{45}}, \frac{2}{\sqrt{45}}$ and $\frac{5}{\sqrt{45}}$

28. Position of a particle in a rectangular-co-ordinate system is $(3, 2, 5)$. Then its position vector will be

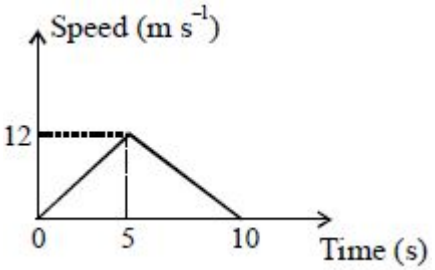
A) $3\hat{i}+5\hat{j}+2\hat{k}$ **B)** $3\hat{i}+2\hat{j}+5\hat{k}$
C) $5\hat{i}+3\hat{j}+2\hat{k}$ **D)** None of these

29. A balloon rises, up with constant net acceleration of $10\,m/s^2$. After $2\,s$ a particle drops from the balloon. After further $2\ s$ match the following columns. (Take $g = 10\,m/s^2$)

colum I	colum II
(A) Height of particle from ground	(p) 0
(B) Speed of particle	(q) 10 SI unit
(C) Displacement of particle	(r) 40 SI unit
(D) Acceleration of particle	(s) 20 SI unit

A) $(A \to r, B \to p, C \to s, D \to q)$
B) $(A \to q, B \to p, C \to s, D \to r)$
C) $(A \to r, B \to s, C \to p, D \to q)$
D) $(A \to q, B \to r, C \to s, D \to p)$

30. The speed-time graph of a particle moving along a fixed direction is shown in the figure. The distance traversed by the particle between $t = 2\ s$ to $t = 6\,s$ is.....m



A) 26 **B)** 36 **C)** 46 **D)** 56

31. If the velocity of a particle is $(10+2t^2)m/s$, then the average acceleration of the particle between $2s$ and $5s$ is.....m/s^2

A) 2 **B)** 4 **C)** 12 **D)** 14

32. A body is thrown vertically upwards. If air resistance is to be taken into account, then the time during which the body rises is

A) Equal to the time of fall
B) Less than the time of fall
C) Greater than the time of fall
D) Twice the time of fall

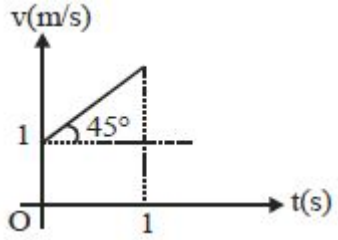
33. A ball of mass m_1 and another ball of mass m_2 are dropped from equal height. If time taken by the balls are t_1 and t_2 respectively, then

A) $t_1 = \frac{t_2}{2}$ **B)** $t_1 = t_2$
C) $t_1 = 4t_2$ **D)** $t_1 = \frac{t_2}{4}$

34. A stone thrown upward with a speed u from the top of the tower reaches the ground with a velocity $3u$. The height of the tower is

A) $3u^2/g$ **B)** $4u^2/g$
C) $6u^2/g$ **D)** $9u^2/g$

35. From the $v-t$ graph, the



A) speed at $t = 1\,s$ is $1.2\,m/s$
B) acceleration is $2\,m/s^2$
C) average speed during $1^{st}\ second$ is $1.5\,m/s$
D) speed of the particle can be zero

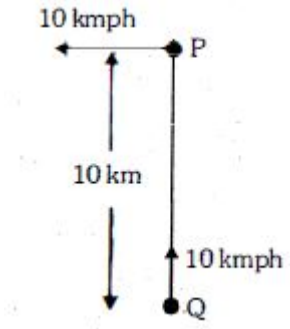
36. Two cars leave one after the other and travel with an acceleration of $0.4\ m/s^2$. Two minutes after the departure of the first, the distance between the cars becomes $1.9\ km$. The time interval between the departures of the cars is .....s

A) 190 **B)** 50 **C)** 80 **D)** 60

37. If $v = x^2 - 5x + 4$, find the acceleration of particle when velocity of the particle is zero

A) 4 **B)** 1 **C)** 3 **D)** 0

38. There are two particles P and Q separated by distance $10\ km$ and moving with velocities $10\ kmph$ as shown on a smooth horizontal surface. The time elapsed before they come at minimum separation is.....hr



A) 1 **B)** 0.5 **C)** 0.25 **D)** 2

39. A $100\ m$ long train is moving with a uniform velocity of $45\ km/hr$. The time taken by the train to cross a bridge of length $1\,km$ is.....s

A) 58 **B)** 68 **C)** 78 **D)** 88

40. A cricketer can throw a ball to a maximum horizontal distance of $100\ m.$ The speed with which he throws the ball is (to the nearest integer) (in ms^{-1})

A) 30 **B)** 42 **C)** 32 **D)** 35

41. A particle moves in a circle of radius $25\,cm$ at two revolutions per second. The acceleration of the particle in $meter/second^2$ is

A) π^2 **B)** $8\,\pi^2$ **C)** $4\,\pi^2$ **D)** $2\,\pi^2$

42. A small block slides down on a smooth inclined plane, starting from rest at time $t = 0$. Let S_n be the distance travelled by the block in the interval $\mathrm{t = n - 1}$ to $\mathrm{t = n}$. Then, the ratio $\frac{\mathrm{S_n}}{\mathrm{S_{n+1}}}$ is

A) $\frac{2n-1}{2n}$ **B)** $\frac{2n-1}{2n+1}$
C) $\frac{2n+1}{2n-1}$ **D)** $\frac{2n}{2n-1}$

43. $Assertion$: Two balls of different masses are thrown vertically upward with same speed. They will pass through their point of projection in the downward direction with the same speed.
$Reason$: The maximum height and downward velocity attained at the point of projection are independent of the mass of the ball

A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
C) If the Assertion is correct but Reason is incorrect.
D) If both the Assertion and Reason are incorrect.

44. A student is standing at a distance of $50\ metres$ from the bus. As soon as the bus begins its motion with an acceleration of $1\ ms^{-2}$, the student starts running towards the bus with a uniform velocity u. Assuming the motion to be along a straight road, the minimum value of u, so that the student is able to catch the bus is.....ms^{-1}

A) 5 **B)** 8 **C)** 10 **D)** 12

45. The position x of a particle varies with time t as $x = at^2 - bt^3$. The acceleration of the particle will be zero at time t equal to

A) $\frac{a}{b}$ **B)** $\frac{2a}{3b}$ **C)** $\frac{a}{3b}$ **D)** Zero