PHYSICS

BOOKS - FULL MARKS PHYSICS (TAMIL ENGLISH)

KINEMATICS

IN-TEXT SOLVED EXAMPLES

1. Two vectors $\vec{A}$ and $\vec{B}$ of magnitude 5 units and 7 units make an angle 60° with each other. Find the magnitude of the difference vector $\vec{A} - \vec{B}$ and its direction with respect to the vector $\vec{A}$.

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Find $\overrightarrow{A} + \overrightarrow{B}, \overrightarrow{B} + \overrightarrow{A}, \overrightarrow{A} - \overrightarrow{B}, \overrightarrow{B} - \overrightarrow{A}$.

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5. Given the vector $\overrightarrow{A} = 2\hat{i} + 3\hat{j}$ what is $3\overrightarrow{A}$?

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6. A vector $\overrightarrow{A}$ is given as in the following figure. Find $4\overrightarrow{A}$ and $-4\overrightarrow{A}$

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7. Given two vectors $\vec{A} = 2\hat{i} + 4\hat{j} + 5\hat{k}$ and $\vec{B} = \hat{i} + 3\hat{j} + 6\vec{k}$.

Find the product $\vec{A}.\vec{B}$ and the magnitudes of $\vec{A}$ and $\vec{B}$. What is the angle between them?

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8. Check whether the following vectors are orthogonal.

(i) $\overrightarrow{A} = 2\hat{i} + 3\hat{j}$ and $\overrightarrow{B} = 4\hat{i} - 5\hat{j}$ (ii) $\overrightarrow{C} = 5\hat{i} + 2\hat{j}$ and $\overrightarrow{D} = 2\hat{i} + 5\hat{j}$

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9. Two vectors are given as $\overrightarrow{r} = 2\hat{i} + 3\hat{j} + 5\hat{k}$ and $\overrightarrow{F} = 3\hat{i} - 2\hat{j} + 4\hat{k}$.

Find the resultant vector $\overrightarrow{\tau} = \overrightarrow{r} \times \overrightarrow{F}$.

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10. Compare the components for the following vector equations

(a) $\overrightarrow{F} = m\overrightarrow{a}$ Here m is a positive number (b) $\overrightarrow{p} = 0$

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11. Determine the value of the T from the given vector equation.

$5\hat{j} - T\hat{j} = 6\hat{j} + 3T\hat{j}$

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19. Find the derivative with respect to t, of the function $x = A_0 + A_1 t + A_2 t^2$ where A_0, A_1 and A_2 are constants.

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20. Fill in the blanks.

	A	B	C
a.	Photoelectric effect	Experimental study by	....
b.	Photoemissive cell	....	Burglar's alarm
c.	de-Broglie wavelength	$\lambda = \frac{h}{mv}$	$\lambda =$ ....
d.	$h\upsilon = \frac{1}{2} m v_{max}^2 + \phi_0$	$h\upsilon =$	$\frac{1}{2} m v_{max}^2 = hc\left(\frac{1}{\lambda} - \frac{1}{\lambda_0}\right)$

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Let the velocities of A and B be $35kmh^{-1}$ due east and $40kmh^{-1}$ due east respectively. What is the relative velocity of car B with respect to A?

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(a) Describe the motion qualitatively in the interval 0 to 55s.

(b) Find the distance and displacement

travelled from 0 to 40 s.

Find the acceleration at t = 5s and at 20 s.

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28. If the position vector of the particle is given by $\vec{r} = 3\hat{t}^2\hat{i} + 5t\hat{j} + 4\hat{k}$, Find the

(a) The velocity of the particle at t=3s

(b) Speed of the particle at t= 3s

(c) Acceleration of the particle at time t=3s

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(a) What are the time taken by the iron ball and feather to reach the ground? (b) What are the velocities of iron ball and feather when they reach the ground? (Ignore air resistance and take $g = 10ms^{-2}$

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34. In the cricket game, a batsman strikes the ball such that it moves with the speed $30ms^{-1}$ at an angle 30° with the horizontal as shown in the figure. The boundary line of the cricket ground is located at a distance of 75 m from the batsman? Will the ball go for a six? (Neglect the air resistance and take acceleration due to gravity $g = 10ms^{-2}$.

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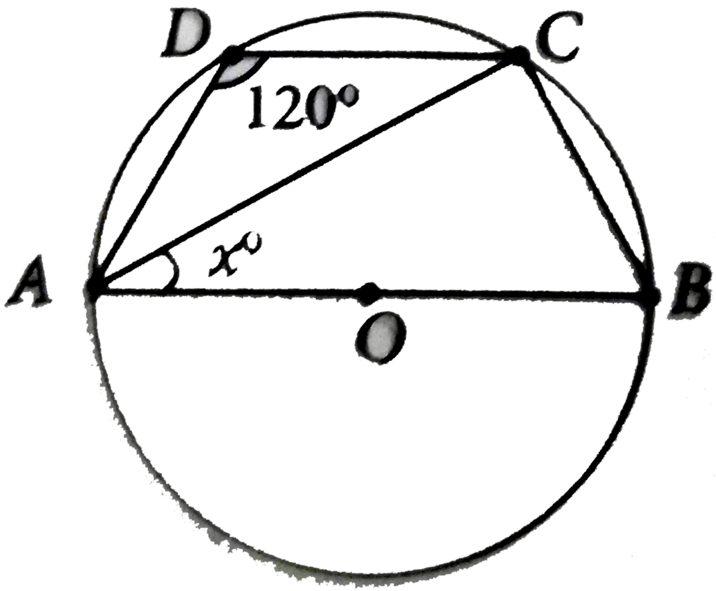
35. Find the value of x in the given figure.



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(a) Find the centripetal and tangential acceleration at 1 = 2 s.

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TEXTUAL QUESTIONS SOLVED (MULTIPLE CHOICE QUESTIONS:)

1. Which one of the following Cartesian coordinate systems is not follwed in physics?

A.

B.

C.

D.

Answer: D

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2. Identify the unit vector in the following .

A. $\hat{i} + \hat{j}$

B. $\frac{\hat{i}}{\sqrt{2}}$

C. $\hat{k} - \frac{\hat{j}}{\sqrt{2}}$

D. $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$

Answer: A::B

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3. Which one of the following physical quantities cannot be represented by a scalar?

A. Mass

B. Length

C. Momentum

D. Magnitude of acceleration

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4. Two objects of masses m_1 and m_2 fall from the heights h_1 and h_2 respectively. The ratio of the magntidue of their momenta when they hit the ground is

A. $\sqrt{\frac{h_1}{h_2}}$

B. $\sqrt{\frac{m_1 h_1}{m_1 h_2}}$

C. $\frac{m_1}{m_2}\sqrt{\frac{h_1}{h_2}}$

D. $\frac{m_1}{m_2}$

Answer: A::B

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5. If a particle has negative velocity and negative acceleration, its speed

A. increases

B. decreases

C. remains same

D. zero

Answer: A::C

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6. If the velocity is $\vec{v} = 2\hat{i} + t^2\hat{j} - 9\hat{k}$ then the magntidue of acceleration at $t = 0.5s$ is

A. $1ms^{-2}$

B. $2ms^{-2}$

C. zero

D. $-1ms^{-2}$

Answer: A::B

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7. If an object is dropped from the top of a building and it reaches the ground at t = 4s, then the height of the building is (ignoring air resistance)$\left(g = 9.8 ms^{-2}\right)$

A. 77.3m

B. 78. 4m

C. 80.5 m

D. 79.2m

Answer: D

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8. A ball is projected vertically upwards with a velocity v . It comes back to ground in time t. which v-t graph shows the motion correctly ?

A.

B.

C.

D.

Answer: C

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9. If one object is dropped vertically downward and another object is thrown horizontally from the same height, then the ratio of vertical distance covered by both objects at any instant t is

A. 1

B. 2

C. 4

D. 0.5

Answer: A

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10. A ball is dropped from some height towards the ground : Which one of the following represents the correct motion of the ball ?

A.

B.

C.

D.

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11. If a particle executes uniform circular motion in the xy plane in clock wise direction, then the angular velocity is in :

A. $+y$ direction

B. $+z$ direction

C. $-z$ direction

D. $-x$ direction

Answer: C::D

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12. If a particle executes uniform circular motion, choose the correct statement

A. The velocity and speed are constant

B. The acceleration and speed are constant

C. The velocity and acceleration are constant.

D. The speed and magnitude of acceleration are constant,

Answer: A::C::D

Watch Video Solution

13. If an object is thrown vertically up with initial speed u from the ground, then the time taken by the object to return back to ground is

A. $\frac{u^2}{2g}$

B. $\frac{u^2}{g}$

C. $\frac{u}{2g}$

D. $\frac{2u}{g}$

Answer: B

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14. Two objects are projected at angles 30° and 60° respectively with respect to the horizontal direction. The range of two objects are denoted as R_{30° and R_{60°. Choose the correct relation from the following.

A. $R_{30^\circ} = R_{60^\circ}$

B. $R_{30^\circ} = 4R_{60^\circ}$

C. $R_{30^\circ} = \dfrac{R_{60^\circ}\gamma}{2}$

D. $R_{30^\circ} = 2R_{60^\circ}$

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15. An object is dropped is an unknown planet from height 50 m, it reaches the ground is 2 s. The acceleration due to gravity in this unknwon planet is

A. $g = 20ms^{-2}$

B. $g = 25ms^{-2}$

C. $g = 15ms^{-2}$

D. $g = 30ms^{-2}$

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C. $R_{30^\circ} = \frac{R_{60^\circ}\gamma}{2}$

D. $R_{30^\circ} = 2R_{60^\circ}$

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30. An object is dropped is an unknown planet from height 50 m, it reaches the ground is 2 s. The acceleration due to gravity in this unknwon planet is

A. $g = 20ms^{-2}$

B. $g = 25ms^{-2}$

C. $g = 15ms^{-2}$

D. $g = 30ms^{-2}$

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TEXTUAL QUESTIONS SOLVED (SHORT ANSWER QUESTIONS)

1. What is meant by Cartesian coordinate system?

Watch Video Solution

2. Define a vector. Give examples.

Watch Video Solution

3. Define a scalar. Give examples

Watch Video Solution

4. Write a short note on the scalar product between two vectors.

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5. Write a short note on vector product between two vectors.

Watch Video Solution

6. How do you deduce that two vectors are perpendicular?

Watch Video Solution

7. Define displacement and distance.

Watch Video Solution

8. Define velocity and speed.

Watch Video Solution

9. Define acceleration.

Watch Video Solution

10. What is the difference between velocity and average velocity?

Watch Video Solution

11. Define a radian.

Watch Video Solution

12. Define angular displacement and angular velocity.

Watch Video Solution

13. What is non uniform circular motion?

Watch Video Solution

14. Write down the Kinematic equations for Angular motion.

Watch Video Solution

15. Write down the expression for angle made by resultant acceleration and radius vector in the non uniform circular motion.

Watch Video Solution

16. What is meant by Cartesian coordinate system?

Watch Video Solution

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18. Define a scalar. Give examples

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29. Write down the Kinematic equations for Angular motion.

Watch Video Solution

30. Write down the expression for angle made by resultant acceleration and radius vector in the non uniform circular motion.

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TEXTUAL QUESTIONS SOLVED (LONG ANSWER QUESTIONS)

1. Explain in detail the triangle law of addition.

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2. Discuss the properties of scalar and vector

Watch Video Solution

3. Derive the kinematic equations of motion for constant acceleration.

Watch Video Solution

4. Derive the equations of motion for a particle (a) falling vertically (b) projected vertically.

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5. Derive the equation of motion, range and maximum height reached by the particle thrown at an oblique angle θ with respect to the horizontal direction.

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6. Derive the expression for centripetal acceleration.

Watch Video Solution

7. Derive the expression for total acceleration in the non-uniform circular motion.

Watch Video Solution

8. Explain in detail the triangle law of addition.

Watch Video Solution

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Watch Video Solution

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13. Derive the expression for centripetal acceleration.

Watch Video Solution

14. Derive the expression for total acceleration in the non-uniform circular motion.

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ADDITIONAL QUESTIONS SOLVED (I.MULTIPLE CHOICE)

1. The radius of the Earth was measured by

A. Newton

B. Eratosthenes

C. Galileo

D. Ptolemy

Answer: A

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2. Kinematics is the branch of mechanics which delas with the motion of objects without taking ________ into account

A. kinetics

B. dynamics

C. kinematics

D. statics

Answer: A::C

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3. If the coordinate axes (x, y, z) are drawn in anticlockwise direction then the coordinate system is known as

A. Cartesian coordinate system

B. right handed coordinate system

C. left handed coordinate system

D. cylindrical coordinate system

Answer: A::C::D

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4. The dimension of point mass is

A. 0

B. 1

C. 2

D. kg

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5. If an object is moving in a straight line then the motion is known as .... Motion

A. linear

B. circular

C. curvilinear

D. rotational

Answer: A

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6. An athlete running on a straight track is an example for the whirling motion of a stone attached to a string is a............... motion.

A. linear

B. circular

C. curvilinear

D. rotational

Answer: A

Watch Video Solution

7. The whirling motion of a stone attached to a string is a .... motion.

A. linear

B. circular

C. curvilinear

D. rotational

Answer: A::C

Watch Video Solution

8. Spinning of the Earth about its own axis is known as .... motion.

A. linear

B. circular

C. curvilinear

D. rotational

Answer: A

Watch Video Solution

9. If an object executes a to and fro motion about a fixed point, is an example for

A. rotational motion

B. vibratory motion

C. circular motion

D. curvilinear motion

Answer: A::B

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10. Vibratory motion is also known as

A. circular motion

B. rotational motion

C. oscillatory motion

D. spinning

Answer: A::C

Watch Video Solution

11. The motion of satellite around the Earth is an example for

A. circular motion

B. rotational motion

C. elliptical motion

D. spinning

Answer: A::C

Watch Video Solution

12. An object falling freely under gravity close to Earth is

A. one dimensional

B. circular motion

C. rotational motion

D. spinning motion

Answer: A::D

Watch Video Solution

13. Motion of a coin on a carrom board is an example of

A. one dimensional motion

B. one dimensional motion

C. three dimensional motion

D. none

Answer: A::D

Watch Video Solution

14. Spreading smoke of incense stick is an example of

A. one dimensional motion

B. two dimensional motion

C. three dimensional motion

D. none

Answer: A::D

Watch Video Solution

15. A bird flying in the sky is an example of

A. one dimensional motion

B. two dimensional motion

C. three dimensional motion

D. none

Answer: A::D

Watch Video Solution

16. Example for scalar is

A. distance

B. displacement

C. velocity

D. angular momentum

Answer: A::C::D

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17. Which of the following is not a scalar ?

A. Volume

B. Angular momentum

C. Relative density

D. Time

Answer: A

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18. Vector is having

A. only magnitude

B. only direction

C. both magnitude and direction

D. either magnitude or direction

Answer: A::B::C::D

Watch Video Solution

19. "norm" of the vector represents

A. only magnitude

B. only direction

C. both magnitude and direction

D. either magnitude or direction

Answer: A::D

Watch Video Solution

20. If two vectors are having equal magnitude and same direction is known as

A. equal vectors

B. collinear vectors

C. parallel vectors

D. on it vector

Answer: A::C

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21. The angle between two collinear vectors is/are,

A. 0°

B. 90°

C. 180°

D. 0° or 180°

Answer: A

Watch Video Solution

22. The angle between parallel vectors is

A. 0°

B. 90°

C. 180°

D. 0° or 180°

Watch Video Solution

23. The angle between anti-parallel vectors is

A. 0°

B. 90°

C. 180°

D. 0° or 180°

Answer: A

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24. Unit vector is

A. having magnitude one but no direction

B. $A\hat{A}$

C. $\frac{A}{|A|}$

D. $|A|$

Answer: A

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25. A unit vector is used to specify

A. only magnitude

B. only direction

C. either magnitude (or) direction

D. absolute value

Answer: C::D

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26. The angle between any two orthogonal unit vectors

A. 0

B. 90°

C. 180°

D. 360°

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27. If $\widehat{n}$ is a unit vector along the direction of $\overrightarrow{A}$ then $\widehat{n}$ is

A. $\overrightarrow{A}A$

B. $n \times A$

C. $\overrightarrow{A}/|A|$

D. $\vec{A}\,|A|$

Answer: A::C

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28. The magnitude of a vector cannot be

A. positive

B. negative

C. zero

D. unity

Answer: A

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29. If $\overrightarrow{R} = \overrightarrow{P} + \overrightarrow{Q}$, then which of the following is true?

A. $P > Q$

B. $Q > P$

C. P=Q

D. $R > P, Q$

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30. A force of 3N and 4N are acting perpendicular to an object, the resultant force is

A. 9N

B. 16N

C. 5N

D. 7N

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31. Torque is a

A. scalar

B. vector

C. either scalar (or) vector

D. none

Answer: C

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32. The resultant of $\vec{A} + \vec{B}$ acts along x-axis.

If $A = 2\hat{i} - 3\hat{j} + 2\hat{k}$ then B is

A. $-2\hat{i} + \hat{j} + \hat{k}$

B. $3\hat{j} - 2\hat{k}$

C. $-2\hat{i} - 3\hat{j}$

D. $-2\hat{i} - 2\hat{k}$

Answer: A::B::C

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33. The angle between $\left(\vec{A}+\vec{B}\right)$ and $\left(\vec{A}-\vec{B}\right)$ can be

A. only 0°

B. only 90°

C. between 0° and 90°

D. between 0° and 180°

Answer: A::B::D

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34. If a vector $\overrightarrow{A} = 3\hat{i} + 2\hat{j}$ then what is 4A?

A. $12\hat{i} + 8\hat{j}$

B. $0.75\hat{i} + 0.5\hat{j}$

C. $3\hat{i} + 2\hat{j}$

D. $7\hat{i} + 6\hat{j}$

Answer: A::B

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35. If $\overrightarrow{P} = m\overrightarrow{V}$ then the direction of $\overrightarrow{P}$ along

A. m

B. v

C. both (a) and (b)

D. neither m nor v

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36. The scalar product $\overrightarrow{A} \, . \, \overrightarrow{B}$ is equal to

A. $\overrightarrow{B} + \overrightarrow{A}$

B. $AB \sin \theta$

C. $AB \cos \theta$

D. $\overrightarrow{B} + \overrightarrow{A}$

Answer: A::B::C

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37. The scalar product $\overrightarrow{A} . \overrightarrow{B}$ is equal to

A. $\overrightarrow{B} + \overrightarrow{A}$

B. $\overrightarrow{B} . \overrightarrow{A}$

C. $AB \sin \theta$

D. $\left(\overrightarrow{A} \times \overrightarrow{B}\right)$

Answer: A::B::C

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38. The scalar product of two vectors will be maximum when θ is equal to

A. 0°

B. 90°

C. 180°

D. 270°

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39. The scalar product of two vectors will be maximum. When θ is equal to

A. 0°

B. 45°

C. 180°

D. 60°

Answer: A

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40. The vectors $\vec{A}$ and $\vec{B}$ to be mutually orthogonal when

A. $\vec{A} + \vec{B} = 0$

B. $\vec{A} - \vec{B} = 0$

C. $\vec{A} . \vec{B} = 0$

D. $\vec{A} \times \vec{B} = 0$

Answer: A::B::C

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41. The magnitude of the vector is

A. A^2

B. $\sqrt{A}^2$

C. $\sqrt{A}$

D. $\sqrt[3]{A}$

Answer: A::B

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42. $\hat{i} . \hat{j}$ is

A. 0

B. 1

C. ∞

D. none

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43. If $\overrightarrow{A}$ and $\overrightarrow{B}$ are two vectors which are acting along x,y respectively, then $\overrightarrow{A} \times \overrightarrow{B}$ lies along

A. x

B. y

C. z

D. none

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44. The direction of $\overrightarrow{A} \times \overrightarrow{B}$ is given by

A. right hand screw rule

B. right hand thumb rule

C. both (a) and (b)

D. neither (a) and (b)

Answer: A::B::D

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45. A vector $\overrightarrow{A}$ points vertically upward and $\overrightarrow{B}$ points towards north. The vector product $\overrightarrow{A} \times \overrightarrow{B}$ is

A. $AB\cos\theta$

B. $AB\sin\theta$

C. $AB\tan\theta$

D. $AB\sec\theta$

Answer: A::B

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46. $\vec{A} \times \vec{B}$ is equal to

A. $\vec{B} \times \vec{A}$

B. $\vec{A} + \vec{B}$

C. $-\left(\vec{B} \times \vec{A}\right)$

D. $\vec{A} - \vec{B}$

Answer: A::B::C

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47. The vector product of any two vectors gives a

A. vector

B. scalar

C. tensor

D. collinear

Answer: C

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48. $\left|\overline{A} \times \overline{B}\right|$ is equal to

A. (a) $-\left|\overline{A} \times \overline{B}\right|$

B. (b) $\left|\overline{B} \times \overline{A}\right|$

C. (c) $-\left|\overline{B} \times \overline{A}\right|$

D. (d) $\dfrac{\overline{A} \times \overline{B}}{\left|\overline{A} \times \overline{B}\right|}$

Answer: A::B

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49. The vector product of two vectors will have maximum magnitude when θ is equal to

A. (a) 0°

B. (b) 90°

C. (c) 180°

D. (d) 360°

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50. The vector product of two non-zero vectors will be minimum when θ is equal to

A. (a) 0°

B. (b) 180°

C. (c) both (a) and (b)

D. (d) neither (a) nor (b)

Answer: A::B::D

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51. The product of a vector with itself is equal to

A. (a) 0

B. (b) 1

C. (c) ∞

D. (d) A^2

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52. $\hat{i} \times \hat{i}$ is

A. (a) 0

B. (b) 1

C. (c) 00

D. (d) $\hat{j}$

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53. $\hat{i} \times \hat{j}$ is

A. (a) $\hat{i}$

B. (b) $\hat{j}$

C. (c) $\hat{k}$

D. (d) $\overrightarrow{z}$

Answer: A

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54. $\hat{j} \times \hat{i}$ is

A. (a) $-\hat{i}$

B. (b) $-\hat{j}$

C. (c) $-\hat{k}$

D. (d) $\overrightarrow{z}$

Answer: A

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55. If two vectors $\overrightarrow{A}$ and $\overrightarrow{B}$ form adjacent sides of parallelogram, then the $\left|\overrightarrow{A}\times\overrightarrow{B}\right|$ will give- of parallelogram

A. (a) length

B. (b) area

C. (c) volume

D. (d) diagonal

Answer: A

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56. If $\overrightarrow{P} - \overrightarrow{Q}$ then which of the following is incorrect?

A. $\overrightarrow{P} = \overrightarrow{Q}$

B. $\left|\overrightarrow{P}\right| = \left|\overrightarrow{Q}\right|$

C. $P\widehat{Q} = Q\widehat{A}$

D. $\widehat{P}\widehat{Q} = PQ$

Answer: A

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57. The momentum of a particle is $\overrightarrow{P} = \cos\theta\hat{i} + \sin\theta\hat{j}$. The angle between momentum and the force acting on a body is

A. 0°

B. 45°

C. 90°

D. 180°

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58. $vce A$ and $\overrightarrow{B}$ are two vectors, if $\overrightarrow{A}$ and $\overrightarrow{B}$ are perpendicular to each other

A. $\overline{A} \times \overline{B} = 0$

B. $\overline{A} \times \overline{B} = 1$

C. $\overline{A} . \overline{B} = 0$

D. $\overline{A} \times \overline{B} = AB$

Answer: A::B

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59. The angle between two vectors $-3\hat{i} + 6\hat{k}$ and $2\hat{i} + 3\hat{j} + \hat{k}$ is

A. (a) 0°

B. (b) 45°

C. (c) 60°

D. (d) 90°

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60. The radius vector is $2\hat{i} + \hat{j} + \hat{k}$ while linear momentum is $2\hat{i} + 3\hat{j} + \hat{k}$. Then the angular momentum is

A. $-2\hat{i} + 4\hat{k}$

B. $4\hat{i} - 8\hat{k}$

C. $2\hat{i} - 4\hat{j} + 2\hat{k}$

D. $4\hat{i} - 8\hat{j}$

Answer: A::B::D

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61. Which of the following cannot be a resultant of two vectors of magnitude 3 and 6?

A. 3

B. 6

C. 10

D. 7

Answer: A

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62. Twelve forces each of magnitude 10N acting on a body at an angle of 30° with other forces then their resultant is

A. (a) 10 N

B. (b) 120N

C. (c) $\frac{10}{\sqrt{3}}$

D. (d) zero

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63. Two forces are in the ratio of 3:4. The maximum and minimum of their resultants are in the ratio is

A. $4:3$

B. $3:4$

C. $7:1$

D. $1:7$

Answer: A

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64. If $\left|\vec{P}+\vec{Q}\right|=\left|\vec{P}\right|+\left|\vec{Q}\right|$. The angle between the vectors $\vec{P}$ and $\vec{Q}$ is

A. 0°

B. 180°

C. 60°

D. 90°

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65. If $\left|\overrightarrow{P}+\overrightarrow{Q}\right|=\left|\overrightarrow{P}\right|-\left|\overrightarrow{Q}\right|$, the the angle between the vectors $\overrightarrow{P}$ and $\overrightarrow{Q}$

A. 0°

B. 90°

C. 180°

D. 360°

Answer: A

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66. If $\left|\vec{P} \times \vec{Q}\right| = \left|\vec{P} . \vec{Q}\right|$ then angle between Pand will be

A. 0°

B. 30°

C. 45°

D. 60°

Answer: D

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67. If $\left|\overrightarrow{P}+\overrightarrow{Q}\right|=\left|\overrightarrow{P}\right|-\left|\overrightarrow{Q}\right|$, the the angle between the vectors $\overrightarrow{P}$ and $\overrightarrow{Q}$

A. 0°

B. 45°

C. 90°

D. 180°

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68. If $\vec{A}$ and $\vec{B}$ are the sides of triangle, then area of triangle

A. $\frac{1}{2}\left|\vec{A}.\vec{B}\right|$

B. $\frac{1}{2}\left|\vec{A}\times\vec{B}\right|$

C. $AB\sin\theta$

D. $AB\cos\theta$

Answer: A::B::C

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69. A particle moves in a circular path of radius 2 cm. If a particle completes 3 rounds, then the distance and displacement of the particle are

A. 0 and 37.7

B. 37.7 and 0

C. 0 and 0

D. 37.7 and 37.7

Answer: A::C::D

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70. If $\overrightarrow{r}_1$ and $\overrightarrow{r}_2$ are position vectors, then the displacement vector is

A. $\overrightarrow{r}_1 \times \overrightarrow{r}_2$

B. $\overrightarrow{r}_1 . \overrightarrow{r}_2$

C. $\overrightarrow{r}_1 - \overrightarrow{r}_2$

D. $\overrightarrow{r}_2 + \overrightarrow{r}_1$

Answer: A::B::C

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71. The ratio of the displacement vector to the corresponding time interval is

A. average speed

B. average velocity

C. instantaneous speed

D. instantaneous velocity

Answer: A::C

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72. The ratio of total path length travelled by the particle in a time interval

A. average speed

B. average velocity

C. instantaneous speed

D. instantaneous velocity

Answer: A::D

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73. The product of mass and velocity of a particle is

A. acceleration

B. force

C. torque

D. momentum

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74. The area under the force, displacement curve is

A. potential energy

B. work done

C. impulse

D. distance

Answer: D

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75. The area under the force, time graph is

A. momentum

B. force

C. workdone

D. impulse

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76. The unit of momentum in SI system is

__________.

A. $kgms^{-1}$

B. $kgms^{-2}$

C. $kgm^{2}s^{-1}$

D. $kg^{-1}m^{2}s^{-1}$

Answer: A

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77. The slope of the position-time graph will give

A. displacement

B. velocity

C. acceleration

D. force

Answer: C

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78. The area under velocity-time graph gives

A. (a) positive

B. (b) negative

C. (c) either positive (or) negative

D. (d) zero

Answer: A

Watch Video Solution

79. The magnitude of distance is always

A. positive

B. negative

C. either positive or negative

D. zero

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80. If two objects A and B are moving along a straight line in the same direction with the velocities V_A and V_B respectively, then the relative velocity is

A. $V_A + V_B$

B. $V_A - V_B$

C. $V_A V_B$

D. V_A / V_B

Answer: A::B

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81. If two objects A and B are moving along a straight line in the opposite direction with the velocities V_A and V_B respectively, then relative velocity is

A. $V_A + V_B$

B. $V_A - V_B$

C. $V_A V_B$

D. V_A / V_B

Answer: A::B

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82. If two objects moving with a velocities of V_A and V_B at an angle of θ between them, the relative velocity is

A. $V_{AB} = \sqrt{V_A^2 + V_B^2 - 2V_A V_B \cos\theta}$

B. $V_{AB} = \sqrt{V_A^2 + V_B^2 + 2V_A V_B \cos\theta}$

C. $V_{AB} = V_A^2 + V_B^2$

D. $V_{AB} = V_A V_B \cos\theta$

Answer: A::B::C

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83. A person moving horizontally with velocity $\bar{V}_m$. The relative velocity of rain with respect to the person is

A. $V_R + V_m$

B. $\sqrt{V_R + V_m}$

C. $V_R - V_m$

D. $\sqrt{V_R^2 + V_m^2}$

Answer: B

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84. A person moving horizontally with velocity $\overline{V}_m$. Rain falls vertically with velocity $\overline{V}_R$. To save himself from the rain, he should hold an umbrella with vertical at an angle of

A. (a) $\tan^{-1}\left(\frac{V_R}{V_m}\right)$

B. (b) $\tan^{-1}\left(\frac{V_m}{V_R}\right)$

C. (c) $\tan\theta = V_m + V_R$

D. (d) $\tan^{-1}(V_R + V_m / V_R - V_m)$

Answer: A

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85. A car starting from rest, accelerates at a constant rate x for sometime after which it decelerates at a constant rate y to come to rest. If the total time elapsed is t, the maximum velocity attained by the car is given by

A. (a) $\frac{xy}{x+y}t$

B. (b) $\dfrac{xy}{x-y}t$

C. (c) $\dfrac{x^2y^2}{x^2+y^2}t$

D. (d) $\dfrac{x^2y^2}{x^2-y^2}t$

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86. A car covers half of its journey with a speed of $10ms^{-1}$ and the other half by $20ms^{-1}$. The average speed of car during the total journey is

A. $70ms^{-1}$

B. $15ms^{-1}$

C. $13.33ms^{-1}$

D. $7.5ms^{-1}$

Answer: A::C

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87. A swimmer can swim in still water at of $10ms^{-1}$. While crossing a river his average speed is $6ms^{-1}$. If he crosses the river in the shortest possible time, what is the speed of flow of water?

A. $16ms^{-1}$

B. $4ms^{-1}$

C. $60ms^{-1}$

D. $8ms^{-1}$

Answer: A

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88. A 100 m long train is travelling from North to South at a speed of $30ms^{-1}$. A bird is flying from South to North at a speed of $10ms^{-1}$. How long will the bird take to cross the train?

A. 3s

B. 2.5s

C. 10s

D. 5s

Answer: B

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89. The first derivative of position vector with respect to time is

A. velocity

B. acceleration

C. force

D. displacement

Answer: C

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90. The second derivative of position vector with respect to time is

A. velocity

B. acceleration

C. force

D. displacement

Answer: A::C

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91. Slope of displacement-time graph at any instant gives :

A. velocity

B. acceleration

C. force

D. displacement

Answer: C

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92. The slope of velocity-time graph gives

A. velocity

B. acceleration

C. force

D. displacement

Answer: A::C

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93. The position vector of a particle is $\vec{r} = 4t^2\hat{i} + 2t\hat{j} + 3t\hat{k}$. The acceleration of a particle is having only

A. X-component

B. Y-component

C. Z-component

D. X-Y component

Answer: C

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94. The position vector of a particle is $\vec{r} = 4t^2\hat{i} + 2t\hat{j} + 3\hat{k}$. The speed of the particle t=5s is

A. $42ms^{-1}$

B. 3s

C. $3ms^{-1}$

D. $40ms^{-1}$

Answer: A::B::D

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95. An object is moving in a straight line with uniform acceleration a, the velocity-time relation is

A. (a) u=v+at

B. (b) v=u+at

C. (c) $v^2 = u^2 + a^2 t^2$

D. (d) $v^2 - u^2 = at$

Answer: A

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96. An object is moving in a straight line with uniform acceleration, the displacement-time relation is

A. (a) $S = ut^2 + \frac{1}{2}at^2$

B. (b) $S = ut - \frac{1}{2}at^2$

C. (c) $S = ut + \frac{1}{2}at^2$

D. (d) $S = ut = at^2$

Answer: A::B

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97. An object is moving in a straight line with uniform acceleration, the velocity-displacement relation is

A. (a) V=u+2as

B. (b) $S = ut + \frac{1}{2}at^2$

C. (c) $V^2 = u^2 - 2as$

D. (d) $V^2 = u^2 + 2as$

Answer: A::B

Watch Video Solution

98. For free falling body, its initial velocity is

A. 0

B. 1

C. ∞

D. none

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99. An object falls from a height h $(h < < R)$ .the speed of the object when it reaches the ground is

A. $\frac{1}{2}\mathrm{gt}^2$

B. $\sqrt{\mathrm{gt}}$

C. gh

D. $\sqrt{2gh}$

Answer: B

Watch Video Solution

100. An object falls from a height h $(h < < R)$.the speed of the object when it reaches the ground is

A. $\frac{1}{2}\mathrm{gt}^2$

B. $\sqrt{2gh}$

C. $\sqrt{\frac{h}{2g}}$

D. $\sqrt{\frac{2g}{h}}$

Answer: B

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101. In the absence of air resistance, horizontal velocity of the projectile is

A. always negative

B. equal to'g'

C. directly proportional to g

D. a constant

Answer: A::C

Watch Video Solution

102. In the horizontal projection, the range of the projectile is

A. $\sqrt{\frac{2h}{g}}$

B. $\sqrt[u]{\frac{h}{g}}$

C. $\sqrt[u]{\frac{g}{2h}}$

D. $\sqrt[u]{\frac{g}{2h}}$

Answer: B

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103. In oblique projection, maximum height attained by the projectile is

A. $\frac{t}{u\cos\theta}$

B. $\frac{u\sin\theta}{2g}$

C. $\frac{2g}{u\sin\theta}$

D. $\frac{u^2\sin^2\theta}{2g}$

Answer: A::B

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104. In oblique projection time of flight of a projectile is

A. $\dfrac{u^2 \sin^2 \theta}{2g}$

B. $\dfrac{u \sin \theta}{g}$

C. $\dfrac{u^2 \sin 2\theta}{g}$

D. $\dfrac{u^2}{g}$

Answer: A

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105. In oblique projection, maximum horizontal range of the projectile is

A. $\frac{u^2 \sin^2 \theta}{2g}$

B. $\frac{u \sin \theta}{g}$

C. $\frac{u^2 \sin 2\theta}{g}$

D. $\frac{u^2}{g}$

Answer: A::B

Watch Video Solution

106. In oblique projection horizontal range of the projectile is

A. $\dfrac{u^2 \sin^2 \theta}{2g}$

B. $\dfrac{u \sin \theta}{g}$

C. $\dfrac{u^2 \sin 2\theta}{2g}$

D. $\dfrac{u^2}{g}$

Answer: B

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107. One radian is equal to

A. $\frac{\pi}{180}$ degree

B. 60°

C. 57.295°

D. 53.925°

Answer: B

Watch Video Solution

108. The relation between linear velocity and angular velocity of a body moving in a circle is

A. $\omega = vr$

B. $\omega = \frac{v}{r}$

C. $\omega = \frac{r}{v}$

D. $v = \frac{r}{\omega}$

Answer: A

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109. Centripetal acceleration is given by

A. $\frac{v^2}{r}$

B. $-\frac{v^2}{r}$

C. $\frac{r}{v^2}$

D. $-\frac{r}{v^2}$

Answer: B

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110. In uniform circular motion

A. Speed changes but velocity constant

B. Velocity changes but speed constant

C. both speed and velocity are constant

D. both speed and velocity are variable

Answer: A::B::C::D

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111. In non-uniform circular motion, the resultant acceleration is given by

A. $a_R = \sqrt{a_t^2 - \left(\frac{V^2}{r}\right)^2}$

B. $a_R = \sqrt{a_t^2 + \left(\frac{V^2}{r}\right)^2}$

C. $a_R = \sqrt{a_t^2 - \left(\frac{r}{V^2}\right)^2}$

D. $a_R = \sqrt{a_t^2 + \left(\frac{r}{V^2}\right)^2}$

Answer: A::B

Watch Video Solution

112. In non-uniform circular motion, the resultant acceleration makes an angle with the radius vector is

A. $\tan^{-1}\left(\frac{ra_t}{v^2}\right)$

B. $\tan^{-1}\left(\frac{a_t}{\left(\frac{r}{v^2}\right)}\right)$

C. $\tan^{-1}\left(\frac{rv^2}{at}\right)$

D. $a_R = \sqrt{a_t^2 + \left(\frac{r}{V^2}\right)^2}$

Answer: A::B

Watch Video Solution

113. A compartment of an uniformly moving train is suddenly detached from the train and stops after covering some distance. The distance covered by the compartment and distance covered by the train in the given time

A. both will be equal

B. second will be half of first

C. first will be half of second

D. none

Answer: A::B::C::D

Watch Video Solution

114. object is dropped from rest. Its v -t graph is

A.

B.

C.

D.

Answer: B

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115. A cyclist starts from the center 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 center along QO as If the round trip takes 10 min, what is the net displacement,

A. 0

B. 1

C. 2

D. 3

Answer: A

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116. Which of the following graph represents the equation y = mx-C?

A.

B.

C.

D.

Answer: B

View Text Solution

117. the displacement in metres of a body varies with time t in second as $y = t2 - t - 2$. The displacement is zero for a positive of t equal to

A. 1s

B. 2s

C. 3s

D. 4s

Answer: B

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118. A particle with radius R is moving in a circular path with constant speed. The time period of the particle is T. Calculate the time for the following after t=T6 . What is the average velocity of the particle

A. 3R/T

B. 4R/T

C. 6R/T

D. 12R/T

Answer: C

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119. What does the area under acceleration-time graph represent for any given time interval

A. Final velocity

B. Distance travelled

C. Change in the velocity in that time interval

D. Displacement of the particle

Answer: C

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120. A meter long narrow bore held horizontally (and closed at one end) contains a 76 cm long mercury thread, which traps a 15 cm column of air. What happens if the tube is held vertically with the open end at the bottom?

A.

B.

C.

D.

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121. Diatomic molecules like hydrogen have energies due to both translational as well as rotational motion. From the equation in kinetic theory PV = 2/3 E,E is the total energy per unit volume

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122. for oxygen molecule with three angstrom value find the molecular volume in fraction of actual volume

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123. $y = -kx^2$ is represented by

A.

B.

C.

D.

Answer: D

View Text Solution

124. $X \propto \frac{1}{y}$ (or) XY= constant is represented by

A.

B.

C.

D.

Answer: B

View Text Solution

125. $y = -e^{-kx}$ is represented by

A.

B.

C.

D.

Answer: B

View Text Solution

126. $Y = 1 - e^{-kx}$ is represented by

A.

B.

C.

D.

Answer: C

View Text Solution

127. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is represented by

A.

B.

C.

D.

Answer: D

View Text Solution

128. Let y=f(x) is a function . Its maximal (or) minimal can be obtained by

A. y=0

B. f(x)=0

C. $\frac{dy}{dx} = 0$

D. $\frac{d^2y}{dx^2} = 0$

Answer: D

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129. A particle at rest starts moving in a horizontal straight line with uniform acceleration The ratio of the distance covered during the fourth and the third second is

A. $\frac{4}{3}$

B. $\frac{26}{9}$

C. $\frac{7}{5}$

D. 2

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130. The distance travelled by a body, falling freely from rest in t=1s, t=2s and t=3s are in the ratio of

A. $1:2:3$

B. $1:3:5$

C. $1:4:9$

D. $9:4:1$

Answer: A::D

Watch Video Solution

131. The displacement of the particle along a straight line at time t is given by $X = a + bt + ct^2$ where a, b, c are constants. The acceleration of the particle is

A. a

B. b

C. c

D. 2c

Answer: B::C

Watch Video Solution

132. Two bullets are fired at an angle of θ and (90 - θ) to the horizontal with same speed. The ratio of their times of flight is

A. $1:1$

B. $1:\tan\theta$

C. $\tan\theta:1$

D. $\tan^2\theta:1$

Answer: A

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133. A particle moves along a circular path under the action of a force. The work done by the force is

A. positive and non-zero

B. zero

C. egative and non-zero

D. none

Watch Video Solution

134. For a particle, revolving in a circle with speed, the acceleration of the particle is (a) along the tangent

A. along the tangent

B. along the radius

C. along its circumference

D. zero

Answer: A::C

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135. A gun fires two bullets with same velocity at 60° and 30° with horizontal. The bullets strike at the same horizontal distance. The ratio of maximum height for the two bullets is in the ratio of

A. $1:2$

B. $3:1$

C. $2:1$

D. $1 : 3$

Answer: A::C

Watch Video Solution

136. A ball is thrown vertically upward at a speed of 10 m/s. When it has reached one half of its maximum height. How high does the ball rise? (g=10ms^(-2)`)

A. 5m

B. 7m

C. 10m

D. 12m

Answer: A

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137. A car moves from X to Y with a uniform speed V_u and returns to Y with a uniform speed V_d The average speed for this round trip is

A. $\sqrt{v_u v_d}$

B. $\dfrac{v_u v_d}{v_u + v_d}$

C. $\dfrac{v_u + v_d}{2}$

D. $\dfrac{2 v_u v_d}{v_d + v_u}$

Answer: B::D

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138. Two projectiles of same mass and with same velocity are thrown at an angle of 60°

and 30° with the horizontal then which of the following will remain same?

A. time of flight

B. range of projectile

C. maximum height reached

D. all the above

Answer: A::C

Watch Video Solution

139. An object of mass 3 kg is at rest. Now a force of $\overrightarrow{F} = 6t^2\hat{i} + 4t\hat{j}$ is applied on the object, then the velocity of object at t=3 second is

A. $18\hat{i} + 3\hat{j}$

B. $18\hat{i} + 6\hat{j}$

C. $3\hat{i} + 18\hat{j}$

D. $18\hat{i} + 4\hat{j}$

Answer: A

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Watch Video Solution

140. During a projectile motion if the maximum height equals the horizontal range,then the angle of projection with the horizontal is :

A. 32°

B. 48°

C. 76°

D. 84°

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141. A bullet is dropped from some height, when another bullet is fired horizontally from the same height. They will hit the ground

A. depends upon mass of bullet

B. depends upon the observer

C. one after another

D. simultaneously

Answer: A

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142. From this velocity-time graph, which of the following is correct?

A. a)Constant acceleration

B. b)Variable acceleration

C. c)Constant velocity

D. d)Variable velocity

Answer: A::B::C

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143. When a projectile is at its maximum height, the direction of its velocity and acceleration are

A. parallel to each other

B. perpendicular to each other

C. anti-parallel to each other

D. depends on its speed

Answer: A::C::D

Watch Video Solution

144. At the highest point of oblique projection, which of the following is correct?

A. velocity of the projectile is zero

B. acceleration of the projectile is zero

C. acceleration of the projectile is vertically downwards

D. velocity of the projectile is vertically downwards

Answer: A::B::C::D

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145. The range of the projectile depends

A. The angle of projection

B. Velocity of projection

C. g

D. all the above

Answer: A::B::C::D

Watch Video Solution

146. A constant force is acting on a particle and also acting perpendicular to the velocity of the particle. The particle describes the motion in a plane. Then

A. angular displacement is zero

B. its velocity is zero

C. its velocity is constant

D. it moves in a circular path

Answer: A::C

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147. If a body moving in a circular path with uniform speed, then

A. the acceleration is directed towards its centre

B. velocity and acceleration are perpendicular to each other

C. speed of the body is constant but its velocity is varying

D. all the above

Answer: A::B::C::D

Watch Video Solution

148. A body is projected vertically upward with the velocity $v = 3\hat{i} + 4\hat{j} ms^{-1}$. The maximum height attained by the body is $(g = 10 ms^{-2})$.

A. 7m

B. 1.25m

C. 8m

D. 0.08m

Answer: A::B

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149. The radius of the Earth was measured by

A. Newton

B. Eratosthenes

C. Galileo

D. Ptolemy

Answer: A

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150. Kinematics is the branch of mechanics which delas with the motion of objects without taking ________ into account

A. kinetics

B. dynamics

C. kinematics

D. statics

Answer: A::C

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151. If the coordinate axes (x, y, z) are drawn in anticlockwise direction then the coordinate system is known as

A. Cartesian coordinate system

B. right handed coordinate system

C. left handed coordinate system

D. cylindrical coordinate system

Answer: A::C::D

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152. The dimension of point mass is

A. 0

B. 1

C. 2

D. kg

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153. If an object is moving in a straight line then the motion is known as .... Motion

A. linear

B. circular

C. curvilinear

D. rotational

Answer: A

Watch Video Solution

154. An athlete running on a straight track is an example for the whirling motion of a stone attached to a string is a.............. motion.

A. linear

B. circular

C. curvilinear

D. rotational

Answer: A

Watch Video Solution

155. The whirling motion of a stone attached to a string is a .... motion.

A. linear

B. circular

C. curvilinear

D. rotational

Answer: A::C

Watch Video Solution

156. Spinning of the Earth about its own axis is known as .... motion.

A. linear

B. circular

C. curvilinear

D. rotational

Answer: A

Watch Video Solution

157. If an object executes a to and fro motion about a fixed point, is an example for

A. rotational motion

B. vibratory motion

C. circular motion

D. curvilinear motion

Answer: A::B

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158. Vibratory motion is also known as

A. circular motion

B. rotational motion

C. oscillatory motion

D. spinning

Answer: A::C

Watch Video Solution

159. The motion of satellite around the Earth is an example for

A. circular motion

B. rotational motion

C. elliptical motion

D. spinning

Answer: A::C

Watch Video Solution

160. An object falling freely under gravity close to Earth is

A. one dimensional

B. circular motion

C. rotational motion

D. spinning motion

Answer: A::D

Watch Video Solution

161. Motion of a coin on a carrom board is an example of

A. one dimensional motion

B. one dimensional motion

C. three dimensional motion

D. none

Answer: A::D

Watch Video Solution

162. Spreading smoke of incense stick is an example of

A. one dimensional motion

B. two dimensional motion

C. three dimensional motion

D. none

Answer: A::D

Watch Video Solution

163. A bird flying in the sky is an example of

A. one dimensional motion

B. two dimensional motion

C. three dimensional motion

D. none

Answer: A::D

Watch Video Solution

164. Example for scalar is

A. distance

B. displacement

C. velocity

D. angular momentum

Answer: A::C::D

Watch Video Solution

165. Which of the following is not a scalar ?

A. Volume

B. Angular momentum

C. Relative density

D. Time

Answer: A

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166. Vector is having

A. only magnitude

B. only direction

C. both magnitude and direction

D. either magnitude or direction

Answer: A::B::C::D

Watch Video Solution

167. "norm" of the vector represents

A. only magnitude

B. only direction

C. both magnitude and direction

D. either magnitude or direction

Answer: A::D

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168. If two vectors are having equal magnitude and same direction is known as

A. equal vectors

B. collinear vectors

C. parallel vectors

D. on it vector

Answer: A::C

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169. The angle between two collinear vectors is/are,

A. 0°

B. 90°

C. 180°

D. 0° or 180°

Answer: A

Watch Video Solution

170. The angle between parallel vectors is

A. 0°

B. 90°

C. 180°

D. 0° or 180°

Watch Video Solution

171. The angle between anti-parallel vectors is

A. 0°

B. 90°

C. 180°

D. 0° or 180°

Answer: A

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172. Unit vector is

A. having magnitude one but no direction

B. $A\hat{A}$

C. $\frac{\hat{A}}{A}$

D. $|A|$

Answer: A

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173. A unit vector is used to specify

A. only magnitude

B. only direction

C. either magnitude (or) direction

D. absolute value

Answer: C::D

Watch Video Solution

174. The angle between any two orthogonal unit vectors

A. 0

B. 90°

C. 180°

D. 360°

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175. If $\hat{n}$ is a unit vector along the direction of $\vec{A}$ then $\hat{n}$ is

A. $\vec{A} A$

B. $n \times A$

C. $\vec{A} / A$

D. $\vec{A}\,|A|$

Answer: A::C

Watch Video Solution

176. The magnitude of a vector cannot be

A. positive

B. negative

C. zero

D. 90°

Answer: A

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177. Which of the following is true?

A. $P > Q$

B. $Q > P$

C. P=Q

D. $R > P, Q$

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178. A force of 3N and 4N are acting perpendicular to an object, the resultant force is

A. 9N

B. 16N

C. 5N

D. 7N

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179. Torque is a

A. scalar

B. vector

C. either scalar (or) vector

D. none

Answer: C

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180. The resultant of $\overrightarrow{A} + \overrightarrow{B}$ acts along x-axis.

If $A = 2\hat{i} - 3\hat{j} + 2\hat{k}$ then B is

A. $-2\hat{i} + \hat{j} + \hat{k}$

B. $3\hat{j} - 2\hat{k}$

C. $-2\hat{i} - 3\hat{j}$

D. $-2\hat{i} - 2\hat{k}$

Answer: A::B::C

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181. The angle between $\left(\vec{A}+\vec{B}\right)$ and $\left(\vec{A}-\vec{B}\right)$ can be

A. only 0°

B. only 90°

C. between 0° and 90°

D. between 0° and 180°

Answer: A::B::D

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182. If a vector $\overrightarrow{A} = 3\hat{i} + 2\hat{j}$ then what is 4A?

A. $12\hat{i} + 8\hat{j}$

B. $0.75\hat{i} + 0.5\hat{j}$

C. $3\hat{i} + 2\hat{j}$

D. $7\hat{i} + 6\hat{j}$

Answer: A::B

Watch Video Solution

183. If $\overrightarrow{P} = m\overrightarrow{V}$ then the direction of $\overrightarrow{P}$ along

A. m

B. v

C. both (a) and (b)

D. neither m nor v

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184. The scalar product $\overrightarrow{A}\,.\,\overrightarrow{B}$ is equal to

A. $\overrightarrow{B}+\overrightarrow{A}$

B. $AB\sin\theta$

C. $AB\cos\theta$

D. $\overrightarrow{B}+\overrightarrow{A}$

Answer: A::B::C

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185. The scalar product $\vec{A} \cdot \vec{B}$ is equal to

A. $\vec{B} + \vec{A}$

B. $\vec{B} \cdot \vec{A}$

C. $AB \sin \theta$

D. $\left(\vec{A} \times \vec{B}\right)$

Answer: A::B::C

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186. The scalar product of two vectors will be maximum when θ is equal to

A. 0°

B. 90°

C. 180°

D. 270°

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187. The scalar product of two vectors will be maximum. When θ is equal to

A. 0°

B. 45°

C. 180°

D. 60°

Answer: A

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188. The vectors $\overrightarrow{A}$ and $\overrightarrow{B}$ to be mutually orthogonal when

A. $\overrightarrow{A} + \overrightarrow{B} = 0$

B. $\overrightarrow{A} - \overrightarrow{B} = 0$

C. $\overrightarrow{A} . \overrightarrow{B} = 0$

D. $\overrightarrow{A} \times \overrightarrow{B} = 0$

Answer: A::B::C

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189. The magnitude of the vector is

A. A^2

B. $\sqrt{A}^2$

C. $\sqrt{A}$

D. $\sqrt[3]{A}$

Answer: A::B

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190. $\hat{i}\,.\,\hat{j}$ is

A. 0

B. 1

C. ∞

D. none

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191. If $\overrightarrow{A}$ and $\overrightarrow{B}$ are two vectors which are acting along x,y respectively, then $\overrightarrow{A} \times \overrightarrow{B}$ lies along

A. x

B. y

C. z

D. none

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192. The direction of $\vec{A} \times \vec{B}$ is given by

A. right hand screw rule

B. right hand thumb rule

C. both (a) and (b)

D. neither (a) and (b)

Answer: A::B::D

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193. $\vec{A} \times \vec{B}$ is equal to

A. $AB\cos\theta$

B. $AB\sin\theta$

C. $AB\tan\theta$

D. $AB\sec\theta$

Answer: A::B

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194. $\overrightarrow{A} \times \overrightarrow{B}$ is equal to

A. $\overrightarrow{B} \times \overrightarrow{A}$

B. $\vec{A} + \vec{B}$

C. $-\left(\vec{B} \times \vec{A}\right)$

D. $\vec{A} - \vec{B}$

Answer: A::B::C

Watch Video Solution

195. The vector product of any two vectors gives a

A. vector

B. scalar

C. tensor

D. collinear

Answer: C

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196. $\left|\overline{A}\times\overline{B}\right|$ is equal to

A. $-\left|\overline{A}\times\overline{B}\right|$

B. $\left|\overline{B}\times\overline{A}\right|$

C. $-\left|\overline{B}\times\overline{A}\right|$

D. $\dfrac{\overline{A}\times\overline{B}}{\left|\overline{A}\times\overline{B}\right|}$

Answer: A::B

Watch Video Solution

197. The vector product of two vectors will have maximum magnitude when θ is equal to

A. 0°

B. 90°

C. 180°

D. 360°

Watch Video Solution

198. The vector product of two non-zero vectors will be minimum when θ is equal to

A. 0°

B. 180°

C. both (a) and (b)

D. neither (a) nor

Answer: A::B::D

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199. The product of a vector with itself is equal to

A. 0

B. 1

C. ∞

D. A^2

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200. $\hat{i} \times \hat{i}$ is

A. 0

B. 1

C. 00

D. $\hat{j}$

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201. $\hat{i} \times \hat{j}$ is

A. $\hat{i}$

B. $\hat{j}$

C. $\hat{k}$

D. $\overrightarrow{z}$

Answer: A

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202. $\hat{j} \times \hat{i}$ is

A. $-\hat{i}$

B. $-\hat{j}$

C. $-\hat{k}$

D. $\overrightarrow{z}$

Answer: A

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203. If two vectors $\vec{A}$ and $\vec{B}$ form adjacent sides of parallelogram, then the $\left|\vec{A} \times \vec{B}\right|$ will give- of parallelogram

A. length

B. area

C. volume

D. diagonal

Answer: A

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204. If $\overrightarrow{P} - \overrightarrow{Q}$ then which of the following is incorrect?

A. $\overrightarrow{P} = \overrightarrow{Q}$

B. $\left|\overrightarrow{P}\right| = \left|\overrightarrow{Q}\right|$

C. $P\widehat{Q} = Q\widehat{A}$

D. $\widehat{P}\widehat{Q} = PQ$

Answer: A

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205. The momentum of a particle is $\vec{P} = \cos\theta\hat{i} + \sin\theta\hat{j}$. The angle between momentum and the force acting on a body is

A. 0°

B. 45°

C. 90°

D. 180°

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206. $vce A$ and $\overrightarrow{B}$ are two vectors, if $\overrightarrow{A}$ and $\overrightarrow{B}$ are perpendicular to each other

A. $\overline{A} \times \overline{B} = 0$

B. $\overline{A} \times \overline{B} = 1$

C. $\overline{A} . \overline{B} = 0$

D. $\overline{A} . \overline{B} = AB$

Answer: A::B

Watch Video Solution

207. The angle between two vectors $-3\hat{i}+6\hat{k}$ and $2\hat{i}+3\hat{j}+\hat{k}$ is

A. 0°

B. 45°

C. 60°

D. 90°

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208. The radius vector is $2\hat{i}+\hat{j}+\hat{k}$ while linear momentum is $2\hat{i}+3\hat{j}+\hat{k}$. Then the angular momentum is

A. $-2\hat{i}+4\hat{k}$

B. $4\hat{i}-8\hat{k}$

C. $2\hat{i}-4\hat{j}+2\hat{k}$

D. $4\hat{i}-8\hat{j}$

Answer: A::B::D

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209. Which of the following cannot be a resultant of two vectors of magnitude 3 and 6?

A. 3

B. 6

C. 10

D. 7

Answer: A

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210. Twelve forces each of magnitude 10N acting on a body at an angle of 30° with other forces then their resultant is

A. 10 N

B. 120N

C. $\dfrac{10}{\sqrt{3}}$

D. zero

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211. Two forces are in the ratio of 3:4. The maximum and minimum of their resultants are in the ratio is

A. $4:3$

B. $3:4$

C. $7:1$

D. $1:7$

Answer: A

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212. If $\left|\vec{P}+\vec{Q}\right|=\left|\vec{P}\right|+\left|\vec{Q}\right|$. The angle between the vectors $\vec{P}$ and $\vec{Q}$ is

A. 0°

B. 180°

C. 60°

D. 90°

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213. If $\left|\vec{P}+\vec{Q}\right|=\left|\vec{P}\right|-\left|\vec{Q}\right|$, the the angle between the vectors $\vec{P}$ and $\vec{Q}$

A. 0°

B. 90°

C. 180°

D. 360°

Answer: A

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214. If $\left|\vec{P} \times \vec{Q}\right| = \left|\vec{P} \cdot \vec{Q}\right|$ then angle between Pand will be

A. 0°

B. 30°

C. 45°

D. 60°

Answer: D

Watch Video Solution

215. If $\left|\overrightarrow{P}+\overrightarrow{Q}\right|=\left|\overrightarrow{P}\right|-\left|\overrightarrow{Q}\right|$, the the angle between the vectors $\overrightarrow{P}$ and $\overrightarrow{Q}$

A. 0°

B. 45°

C. 90°

D. 180°

Watch Video Solution

216. If $\vec{A}$ and $\vec{B}$ are the sides of triangle, then area of triangle

A. $\frac{1}{2}\left|\vec{A}\,.\,\vec{B}\right|$

B. $\frac{1}{2}\left|\vec{A}\times\vec{B}\right|$

C. $AB\sin\theta$

D. $AB\cos\theta$

Answer: A::B::C

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217. A particle moves in a circular path of radius 2 cm. If a particle completes 3 rounds, then the distance and displacement of the particle are

A. 0 and 37.7

B. 37.7 and 0

C. 0 and 0

D. 37.7 and 37.7

Answer: A::C::D

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218. If $\overrightarrow{r}_1$ and $\overrightarrow{r}_2$ are position vectors, then the displacement vector is

A. $\overrightarrow{r}_1 \times \overrightarrow{r}_2$

B. $\overrightarrow{r}_1 . \overrightarrow{r}_2$

C. $\overrightarrow{r}_1 + \overrightarrow{r}_2$

D. $\overrightarrow{r}_2 + \overrightarrow{r}_1$

Answer: A::B::C

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219. The ratio of the displacement vector to the corresponding time interval is

A. average speed

B. average velocity

C. instantaneous speed

D. instantaneous velocity

Answer: A::C

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220. The ratio of total path length travelled by the particle in a time interval

A. average speed

B. average velocity

C. instantaneous speed

D. instantaneous velocity

Answer: A::D

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221. The product of mass and velocity of a particle is

A. acceleration

B. force

C. torque

D. momentum

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222. The area under the force, displacement curve is

A. potential energy

B. work done

C. impulse

D. work done

Answer: D

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223. The area under the force, time graph is

A. momentum

B. force

C. workdone

D. impulse

Watch Video Solution

224. The unit of momentum in SI system is

__________.

A. $kgms^{-1}$

B. $kgms^{-2}$

C. kgm^2s^{-1}

D. $kg^{-1}m^2s^{-1}$

Answer: A

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225. The slope of the position-time graph will give

A. displacement

B. velocity

C. acceleration

D. force

Answer: C

Watch Video Solution

226. The area under velocity-time graph gives

A. positive

B. negative

C. either positive (or) negative

D. zero

Answer: A

Watch Video Solution

227. The magnitude of distance is always

A. positive

B. negative

C. either positive

D. negative

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228. If two objects A and B are moving along a straight line in the same direction with the velocities V_A and V_B respectively, then the relative velocity is

A. $V_A + V_B$

B. $V_A - V_B$

C. $V_A V_B$

D. V_A / V_B

Answer: A::B

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229. If two objects A and B are moving along a straight line in the opposite direction with the velocities V_A and V_B respectively, then relative velocity is

A. $V_A + V_B$

B. $V_A - V_B$

C. $V_A V_B$

D. V_A / V_B

Answer: A::B

Watch Video Solution

230. If two objects moving with a velocities of V_A and V_B at an angle of θ between them, the relative velocity is

A. $V_{AB} = \sqrt{V_A^2 + V_B^2 - 2V_A V_B \cos\theta}$

B. $V_{AB} = \sqrt{V_A^2 + V_B^2 + 2V_A V_B \cos\theta}$

C. $V_{AB} = V_A^2 + V_B^2$

D. $V_{AB} = V_A V_B \cos\theta$

Answer: A::B::C

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231. A person moving horizontally with velocity $\overline{V}_m$. The relative velocity of rain with respect to the person is

A. $V_R + V_m$

B. $\sqrt{V_R + V_m}$

C. $V_R - V_m$

D. $\sqrt{V_R^2 + V_m^2}$

Answer: B

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232. A person moving horizontally with velocity $\overline{V}_m$. Rain falls vertically with velocity

$\overline{V}_R$. To save himself from the rain, he should hold an umbrella with vertical at an angle of

A. $\tan^{-1}\left(\frac{V_R}{V_m}\right)$

B. $\tan^{-1}\left(\frac{V_m}{V_R}\right)$

C. $\tan\theta = V_m + V_R$

D. $\tan^{-1}(V_R + V_m / V_R - V_m)$

Answer: A

Watch Video Solution

233. A car starting from rest, accelerates at a constant rate x for sometime after which it decelerates at a constant rate y to come to rest. If the total time elapsed is t, the maximum velocity attained by the car is given by

A. $\frac{xy}{x+y}t$

B. $\frac{xy}{x-y}t$

C. $\frac{x^2y^2}{x^2+y^2}t$

D. $\frac{x^2y^2}{x^2-y^2}t$

Watch Video Solution

234. A car covers half of its journey with a speed of $10ms^{-1}$ and the other half by $20ms^{-1}$. The average speed of car during the total journey is

A. $70ms^{-1}$

B. $15ms^{-1}$

C. $13.33ms^{-1}$

D. $7.5ms^{-1}$

Answer: A::C

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235. A swimmer can swim in still water at of $10ms^{-1}$. While crossing a river his average speed is $6ms^{-1}$. If he crosses the river in the shortest possible time, what is the speed of flow of water?

A. $16ms^{-1}$

B. $4ms^{-1}$

C. $60ms^{-1}$

D. $8ms^{-1}$

Answer: A

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236. A 100 m long train is travelling from North to South at a speed of $30ms^{-1}$. A bird is flying from South to North at a speed of

$10 ms^{-1}$. How long will the bird take to cross the train?

A. 3s

B. 2.5s

C. 10s

D. 5s

Answer: B

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237. The first derivative of position vector with respect to time is

A. velocity

B. acceleration

C. force

D. displacement

Answer: C

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238. The second derivative of position vector with respect to time is

A. velocity

B. acceleration

C. force

D. displacement

Answer: A::C

Watch Video Solution

239. The slope of the speed-time graph gives ________.

A. velocity

B. acceleration

C. force

D. displacement

Answer: C

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240. The slope of velocity-time graph gives

A. velocity

B. acceleration

C. force

D. displacement

Answer: A::C

Watch Video Solution

241. The position vector of a particle is $\overrightarrow{r} = 4t^2\hat{i} + 2t\hat{j} + 3t\hat{k}$. The acceleration of a particle is having only

A. X-component

B. Y-component

C. Z-component

D. X-Y component

Answer: C

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242. The position vector of a particle is $\vec{r} = 4t^2\hat{i} + 2t\hat{j} + 3\hat{k}$. The speed of the particle t=5s is

A. $42ms^{-1}$

B. 3s

C. $3ms^{-1}$

D. $40ms^{-1}$

Answer: A::B::D

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243. An object is moving in a straight line with uniform acceleration a, the velocity-time relation is

A. u=v+at

B. v=u+at

C. $v^2 = u^2 + a^2t^2$

D. $v^2 - u^2 = at$

Answer: A

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244. An object is moving in a straight line with uniform acceleration, the displacement-time relation is

A. $S = ut^2 + \frac{1}{2}at^2$

B. $S = ut - \frac{1}{2}at^2$

C. $S = ut + \frac{1}{2}at^2$

D. $S = ut = at^2$

Answer: A::B

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245. An object is moving in a straight line with uniform acceleration, the velocity-displacement relation is

A. V=u+2as

B. $S = ut + \frac{1}{2}at^2$

C. $V^2 = u^2 - 2as$

D. $V^2 = u^2 + 2as$

Answer: A::B

Watch Video Solution

246. For free falling body, its initial velocity is

A. 0

B. 1

C. ∞

D. none

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247. An object falls from a height h $(h < < R)$.the speed of the object when it reaches the ground is

A. $\frac{1}{2}\mathrm{gt}^2$

B. $\sqrt{\mathrm{gt}}$

C. gh

D. $\sqrt{2gh}$

Answer: B

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248. An object falls from a height h $(h << R)$.the speed of the object when it reaches the ground is

A. $\frac{1}{2}\mathrm{gt}^2$

B. $\sqrt{2gh}$

C. $\sqrt{\frac{2h}{g}}$

D. $\sqrt{\frac{2g}{h}}$

Answer: B

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249. In the absence of air resistance, horizontal velocity of the projectile is

A. always negative

B. equal to'g'

C. directly proportional to g

D. a constant

Answer: A::C

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250. In the horizontal projection, the range of the projectile is

A. $\sqrt{\frac{2h}{g}}$

B. $\sqrt[u]{\frac{h}{g}}$

C. $\sqrt[u]{\frac{g}{2h}}$

D. $\sqrt[u]{\frac{g}{2h}}$

Answer: B

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251. In oblique projection, maximum height attained by the projectile is

A. $\dfrac{t}{u\cos\theta}$

B. $\dfrac{u\sin\theta}{2g}$

C. $\dfrac{2g}{u\sin\theta}$

D. $\dfrac{u^2\sin^2\theta}{2g}$

Answer: A::B

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252. In oblique projection time of flight of a projectile is

A. $\frac{u^2 \sin^2 \theta}{2g}$

B. $\frac{u \sin \theta}{g}$

C. $\frac{u^2 \sin 2\theta}{g}$

D. $\frac{u^2}{g}$

Answer: A

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253. In the horizontal projection, the range of the projectile is

A. $\dfrac{u^2 \sin^2 \theta}{2g}$

B. $\dfrac{u \sin \theta}{g}$

C. $\dfrac{u^2 \sin 2\theta}{g}$

D. $\dfrac{u^2}{g}$

Answer: A::B

Watch Video Solution

254. In oblique projection, maximum height attained by the projectile is

A. $\dfrac{u^2 \sin^2 \theta}{2g}$

B. $\dfrac{u \sin \theta}{g}$

C. $\dfrac{u^2 \sin 2\theta}{2g}$

D. $\dfrac{u^2}{g}$

Answer: B

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255. One radian is equal to

A. $\frac{\pi}{180}$ degree

B. 60°

C. 57.295°

D. 53.925°

Answer: B

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256. The relation between linear and angular velocity is

A. $\omega = vr$

B. $\omega = \frac{v}{r}$

C. $\omega = \frac{r}{v}$

D. $v = \frac{r}{\omega}$

Answer: A

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257. Centripetal acceleration is given by

A. $\frac{v^2}{r}$

B. $-\frac{v^2}{r}$

C. $\frac{r}{v^2}$

D. $-\frac{r}{v^2}$

Answer: B

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258. In uniform circular motion

A. Speed changes but velocity constant

B. Velocity changes but speed constant

C. both speed and velocity are constant

D. both speed and velocity are variable

Answer: A::B::C::D

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259. In non-uniform circular motion, the resultant acceleration is given by

A. $a_R = \sqrt{a_t^2 - \left(\frac{V^2}{r}\right)^2}$

B. $a_R = \sqrt{a_t^2 + \left(\frac{V^2}{r}\right)^2}$

C. $a_R = \sqrt{a_t^2 - \left(\frac{r}{V^2}\right)^2}$

D. $a_R = \sqrt{a_t^2 + \left(\frac{r}{V^2}\right)^2}$

Answer: A::B

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260. In non-uniform circular motion, the resultant acceleration makes an angle with the radius vector is

A. $\tan^{-1}\left(\frac{ra_t}{v^2}\right)$

B. $\tan^{-1}\left(\frac{a_t}{\left(\frac{r}{v^2}\right)}\right)$

C. $\tan^{-1}\left(\frac{rv^2}{at}\right)$

D. $a_R = \sqrt{a_t^2 + \left(\frac{r}{V^2}\right)^2}$

Answer: A::B

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261. A compartment of an uniformly moving train is suddenly detached from the train and stops after covering some distance. The distance covered by the compartment and distance covered by the train in the given time

A. both will be equal

B. second will be half of first

C. first will be half of second

D. none

Answer: A::B::C::D

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262. object is dropped from rest. Its v -t graph is

A.

B.

C.

D.

Answer: B

263. When a ball hits the ground as free fall and rebounces but less than its original height? Which is represented by

A.

B.

C.

D.

Answer: C

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264. Which of the following graph represents the equation y = mx-C?

A.

B.

C.

D.

Answer: B

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265. Which of the following graph represents the equation v - mx + C?

A.

B.

C.

D.

Answer: D

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266. Which of the following graph represents the equation y=mx?

A.

B.

C.

D.

Answer: A

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267. Which of the following graph represents the equation y-mx + C?

A.

B.

C.

D.

Answer: C

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268. Which of the following graph represents the equation $y - kx^2$?

A.

B.

C.

D.

Answer: A

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269. $X = -ky^2$ is represented by

A. 

B. 

C. 

D. 

Answer: C

View Text Solution

270. $X = ky^2$ is represented by

A.

B.

C.

D.

Answer: A

View Text Solution

271. $y = -kx^2$ is represented by

A.

B.

C.

D.

Answer: D

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272. $X \propto \frac{1}{y}$ (or) XY= constant is represented by

A.

B.

C.

D.

Answer: B

View Text Solution

273. $y = -e^{-kx}$ is represented by

A.

B.

C.

D.

Answer: B

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274. $Y = 1 - e^{-kx}$ is represented by

A.

B.

C.

D.

Answer: C

View Text Solution

275. $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ is represented by

A.

B.

C.

D.

Answer: D

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276. Let y=f(x) is a function . Its maximal (or) minimal can be obtained by

A. y=0

B. f(x)=0

C. $\frac{dy}{dx} = 0$

D. $\frac{d^2y}{dx^2} = 0$

Answer: D

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277. A particle at rest starts moving in a horizontal straight line with uniform acceleration The ratio of the distance covered during the fourth and the third second is

A. $\frac{4}{3}$

B. $\frac{26}{9}$

C. $\frac{7}{5}$

D. 2

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278. The distance travelled by a body, falling freely from rest in t=1s, t=2s and t=3s are in the ratio of

A. $1:2:3$

B. $1:3:5$

C. $1:4:9$

D. $9:4:1$

Answer: A::D

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279. The displacement of the particle along a straight line at time t is given by

$X = a + bt + ct^2$ where a, b, c are constants.

The acceleration of the particle is

A. a

B. b

C. c

D. 2c

Answer: B::C

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280. Two bullets are fired at an angle of θ and (90 - θ) to the horizontal with same speed. The ratio of their times of flight is

A. $1:1$

B. $1:\tan\theta$

C. $\tan\theta:1$

D. $\tan^2\theta:1$

Answer: A

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281. A particle moves along a circular path under the action of a force. The work done by the force is

A. positive and non-zero

B. zero

C. egative and non-zero

D. none

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282. For a particle, revolving in a circle with speed, the acceleration of the particle is (a) along the tangent

A. along the tangent

B. along the radius

C. along its circumference

D. zero

Answer: A::C

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283. A gun fires two bullets with same velocity at 60° and 30° with horizontal. The bullets strike at the same horizontal distance. The ratio of maximum height for the two bullets is in the ratio of

A. $1:2$

B. $3:1$

C. $2:1$

D. $1:3$

Answer: A::C

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284. A ball is thrown vertically upward at a speed of 10 m/s. When it has reached one half of its maximum height. How high does the ball rise? (g=10ms^(-2)`)

A. 5m

B. 7m

C. 10m

D. 12m

Answer: A

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285. A car moves from X to Y with a uniform speed V_u and returns to Y with a uniform speed V_d The average speed for this round trip is

A. $\sqrt{v_u v_d}$

B. $\dfrac{v_u v_d}{v_u + v_d}$

C. $\dfrac{v_u + v_d}{2}$

D. $\dfrac{2v_u v_d}{v_d + v_u}$

Answer: B::D

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286. Two projectiles of same mass and with same velocity are thrown at an angle of 60° and 30° with the horizontal then which of the following will remain same?

A. time of flight

B. range of projectile

C. maximum height reached

D. all the above

Answer: A::C

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287. An object of mass 3 kg is at rest. Now a force of $\overrightarrow{F} = 6t^2\hat{i} + 4t\hat{j}$ is applied on the object, then the velocity of object at t=3 second is

A. $18\hat{i} + 3\hat{j}$

B. $18\hat{i} + 6\hat{j}$

C. $3\hat{i} + 18\hat{j}$

D. $18\hat{i} + 4\hat{j}$

Answer: A

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288. During a projectile motion if the maximum height equals the horizontal range,then the angle of projection with the horizontal is :

A. 32°

B. 48°

C. 76°

D. 84°

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289. A bullet is dropped from some height, when another bullet is fired horizontally from the same height. They will hit the ground

A. depends upon mass of bullet

B. depends upon the observer

C. one after another

D. simultaneously

Answer: A

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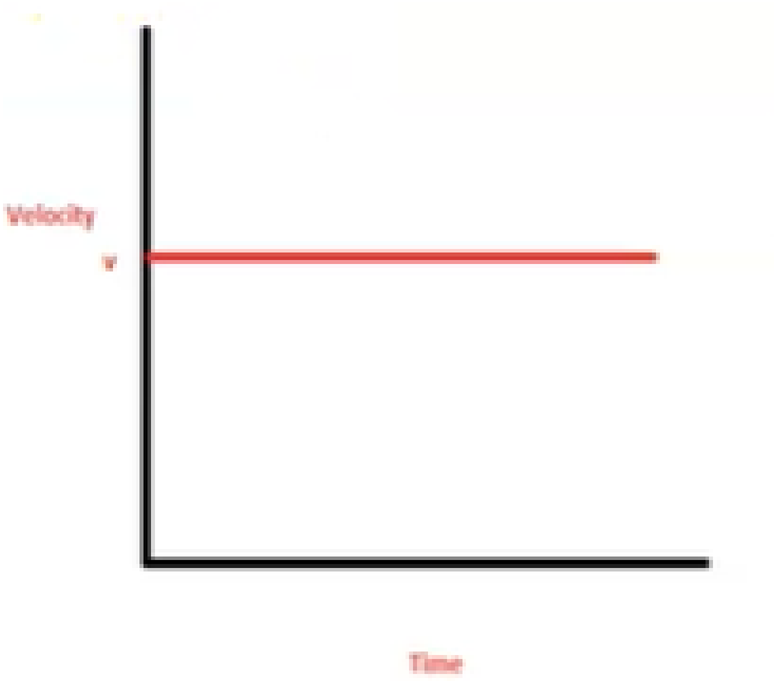
290. From this velocity-time graph, which of the following is correct?



A. Constant acceleration

B. Variable acceleration

C. Constant velocity

D. Variable velocity

Answer: A::B::C

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291. When a projectile is at its maximum height, the direction of its velocity and acceleration are

A. parallel to each other

B. perpendicular to each other

C. anti-parallel to each other

D. depends on its speed

Answer: A::C::D

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292. At the highest point of oblique projection, which of the following is correct?

A. velocity of the projectile is zero

B. acceleration of the projectile is zero

C. acceleration of the projectile is vertically downwards

D. velocity of the projectile is vertically downwards

Answer: A::B::C::D

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293. The range of the projectile depends

A. The angle of projection depends

B. Velocity of projection

C. g

D. all the above

Answer: A::B::C::D

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294. A constant force is acting on a particle and also acting perpendicular to the velocity of the particle. The particle describes the motion in a plane. Then

A. angular displacement is zero

B. its velocity is zero

C. its velocity is constant

D. it moves in a circular path

Answer: A::C

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295. If a body moving in a circular path with uniform speed, then

A. the acceleration is directed towards its centre

B. velocity and acceleration are perpendicular to each other

C. speed of the body is constant but its velocity is varying

D. all the above

Answer: A::B::C::D

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296. A body is projected vertically upward with the velocity $v = 3\hat{i} + 4\hat{j} ms^{-1}$. The maximum height attained by the body is $(g = 10 ms^{-2})$.

A. 7m

B. 1.25m

C. 8m

D. 0.08m

Answer: A::B

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ADDITIONAL QUESTIONS SOLVED (SHORT ANSWER QUESTIONS - 1 (2 MARKS))

1. What are positive and negative acceleration in straight line motion?

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2. Can a body have zero velocity and still be accelerating ?

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3. The displacement of a body is proportional to t3, where t is What is tinc nature of acceleration -time graph of the body?

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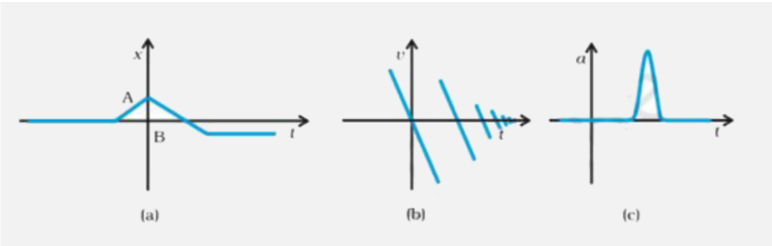
4. Suggest a suitable physical situation for each of the following graphs (Fig.)



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5. An object is in uniform motion along a straight line, what will be position time graph for the motion of object, if

(i) x_0 = positive, v = negative is constant.

(i) x_0 positive, v = negative $\left|\vec{v}\right|$ is constant.

(ii) both x_0 and vare negatively is constant.

(iii) x_0 = negative, v = positive $\left|\vec{v}\right|$ is constant.

(iv) both x_0 and v are positive $\left|\vec{v}\right|$ is constant,

where x_0 is position at t = 0.

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6. Calculate the acceleration of the bicycle of mass 25 kg as

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7. What will be the effect on horizontal range of a projectile when its initial velocity is doubled keeping angle of projection same?

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8. The greatest height to which a man can throw a stone is h. What will be the greatest distance upto which he can throw the stone?

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9. A person sitting in a train moving at constant velocity throws a ball vertically upwards. How will the ball appear to move to an observer?

(i) Sitting inside the train

(ii) Standing outside the train

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10. A gunman always keep his gun slightly tilted above the line of sight while shooting. Why?

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11. What are positive and negative acceleration in straight line motion?

Watch Video Solution

12. Can a body have zero velocity and still be accelerating ?

Watch Video Solution

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Watch Video Solution

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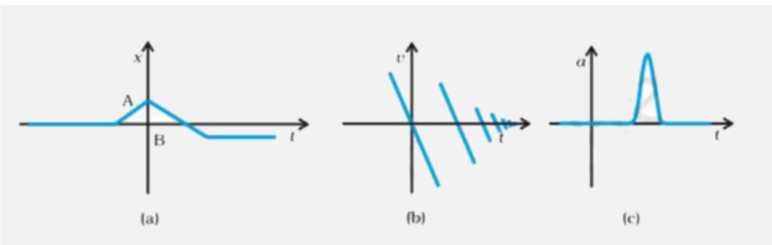

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(ii) both x_0 and vare negatively is constant.

(iii) x_0 = negative, v = positive $\left|\vec{v}\right|$ is constant.

(iv) both x_0 and v are positive $\left|\vec{v}\right|$ is constant,

where x_0 is position at t = 0.

16. Acyclist starts from centre of a circular park of radius 1 km and moves along the path OPRQO as shown. If he maintains constant speed of $10ms^{-1}$. What is his acceleration at point R in magnitude & direction?

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17. What will be the effect on horizontal range of a projectile when its initial velocity is doubled keeping angle of projection same?

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18. The greatest height to which a man can throw a stone is h. What will be the greatest distance upto which he can throw the stone?

Watch Video Solution

19. A person sitting in a train moving at constant velocity throws a ball vertically upwards. How will the ball appear to move to an observer?

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(ii) Standing outside the train

Watch Video Solution

20. A gunman always keep his gun slightly tilted above the line of sight while shooting. Why?

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ADDITIONAL QUESTIONS SOLVED (NUMERICAL QUESTIONS)

1. The V-t graphs of two objects make angle 30° and 60° with the time axis. Find the ratio of their accelerations.

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2. When the angle between two vectors of equal magnitudes is 2/3, prove that the magnitude of the resultant is equal to either.

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3. If $\overrightarrow{A} = 3\hat{i} + 4\hat{j}$ and $\overrightarrow{B} = 7\hat{i} + 24\hat{j}$, find a vector having the same magnitude as $\overrightarrow{B}$ and parallel to $\overrightarrow{A}$.

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4. What is the vector sum of n coplanar forces, each of magnitude F, if each force makes an angle $\frac{2\pi}{n}$ with the preceding force?

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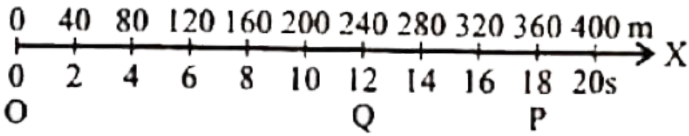
5. A van is moving along x-axis . As shown in the figure , it moves from O to P in 18 s and returns from P to Q in 6s . What are the average velocity and average speed of the van in going from .

From O to P and back to Q ?



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6. On a 60 km straight road, a bus travels the first 30km with a uniform speed of $30kmh^{-1}$. How fast must the bus travel the next 30 km so as to have average speed of $40kmh^{-1}$ for the entire tirp?

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7. The displacement r of a particle varies with time as $x = 4t^2 - 15t + 25$ Find the position, velocity and acceleration of the particle at t = 0

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8. A driver takes 0.20 second to apply the brakes (reaction time). If he is driving car at a speed of $54kmh^{-1}$ and the brakes cause a deceleration of $6.0ms^{-1}$? Find the distance travelled by car after he sees the need to put the brakes.

Watch Video Solution

9. From the top of a tower 100 m in height a ball is dropped and at the same time another ball is projected vertically upwards from the ground with a velocity of 25 m/s. Find when and where the two balls will meet? (g=9.8m/s)

Watch Video Solution

10. A ball is thrown vertically upwards with the speed of $19.6 ms^{-1}$ from the top of building and reaches the earth in 6 s. Find the height of the building .

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11. Two town A and B are connected by a regular bus service with a bus leaving in either direction every T min. A man cycling with a speed of $20 kmh^{-1}$ in the direction A to B notices that a bus goes past him every 18 min in the direction of his motion, and every 6 min in the opposite direction.

What is the period T of the bus service and with what speed do the buses ply of the road?

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12. A motorheal is racing towards north at $25 kmh^{-1}$ and the water current in that region is $10 kmh^{-1}$ in the direction of 60 cast of south. Find the resultant velocity of the boat.

Watch Video Solution

13. An aircraft is flying at a height of 3400 m above the ground. If the angle subtended at a ground observation point by the aircraft position 10 second apart is 30°, what is the speed of the aircraft?

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14. A boat is moving with a velocity $\left(3\hat{i}-4\hat{j}\right)$ with respect to ground. The water in river is flowing with a velocity $\left(-3\hat{i}-4\hat{j}\right)$ with respect to ground. What is the relative velocity of boat with respect to river?

Watch Video Solution

15. A hiker stands on the edge of a cliff 490 m above the ground and throws a stone horizontally with an initial speed of $15ms^{-1}$ Neglecting air resistance, find the time taken by the stone to reach the ground and the speed with which it hits the ground? $(g = 9.8 ms^{-2})$

Watch Video Solution

16. A bullet fired at an angle of 30° with the horizontal hits the ground 3 km away. By adjusting the angle of projection, can one hope to hit the target 5 km away? Assume that the muzzle speed to be fixed and neglect air resistance.

Watch Video Solution

17. A stone tied to the end of a string 80 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 25 seconds, what is the magnitude and direction of acceleration of the stone?

Watch Video Solution

18. A cyclist is riding with a speed of $27kmh^{-1}$. As he approaches a circular turn on the road of radius 80 m, he applies brakes and reduces his speed at the constant rate $0.5ms^{-2}$. What is the magnitude and direction of the net acceleration of the cyclist on the circular turn?

Watch Video Solution

19. If the magnitude of two vectors are 3 and 4 and their scalar product is 6, find angle between them and also find $\left|\vec{A} \times \vec{B}\right|$.

Watch Video Solution

20. Find the value of λ so that the vector $\overrightarrow{A} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\overrightarrow{B} = 4\hat{i} - 2\hat{j} + 2\hat{k}$ perpendicular to each other.

Watch Video Solution

21. The velocity time graph of a particle is given by

(i) Calculate distance and displacement of particle from given v-graph.

(ii) Specify the time for which particle v (m/s) undergone acceleration, retardation and moves with constant velocity.

(iii) Calculate acceleration, retardation from given v-t graph.

(iv) Draw acceleration-time graph of given v-t graph.

22. Molar volqme is the volume occupied by 1 mol of any (ideal) gas at standard temperature and pressure (STP : 1 atmospheric pressure, 0°C). Show that it is 22.4 litres.

Watch Video Solution

23. if C and R denotes capacitance and resistance what is the dimension of CxR

A. [MOLOTOAO]

B. MLOTA-2

C. MLOTA2

D. MLTA-2

Watch Video Solution

24. Three vessels of equal capacity have gases at the same temperature and pressure. The first vessel contains neon (monatomic), the second contains chlorine (diatomic), and the third contains uranium hexafluoride (polyatomic). Do the vessels contain equal number of respective molecules? Is the root mean square speed of molecules the same in the three cases? If not, in which case is vms the largest?

Watch Video Solution

25. An oxygen cylinder of volume 30 liters has an initial gauge pressure of 15 atm and a temperature of 27°C. After some oxygen is withdrawn from the cylinder, the gauge pressure drops to 11 atm and its temperature drops to 17°C. Estimate the mass of oxygen taken out of the cylinder (R = 8.31 J mol-1 K-1, molecular mass of 02 = 32 u).

Watch Video Solution

26. A car is moving along X-axis. As shown in figure it moves from 0 to P in 18 seconds and return from P to Q in 6 seconds. What are the average velocity and average speed of the car in going from

(I) O to P

(II) From O to P and back to Q

View Text Solution

27. To keep a piece of paper horizontal, you should blow over, not under, it.

Watch Video Solution

28. When we try to close a water tap with our fingers, fast jets of water gush through the openings between our fingers.

Watch Video Solution

29. The size of a needle of a syringe controls flow rate better than the thumb pressure exerted by a doctor while administering an injection.

Watch Video Solution

30. A fluid flowing out of a small hole in a vessel results in a backward thurst on the vessel.

Watch Video Solution

31. A ball thrown vertically upwards with a speed of $19.6ms^{-1}$ from the top of a tower returns to the Earth in 6s. Find the height of the tower. $(g = 9.8m/s^2)$

Watch Video Solution

32. A vertical off-shore structure is built to withstand maximum stress of 109 Pa. Is the structure suitable for putting up on top of an oil well in the ocean? Take the depth of the ocean to be roughly 3 km, and ignore ocean currents.

Watch Video Solution

33. A hydraulic automobile lift is designed to lift cars with a maximum mass of 3000 kg. The

area of cross-section of the piston carrying the load is 425 cm2. What maximum pressure would the smaller piston have to bear?

Watch Video Solution

34. Can Bernoulli's equation be used to describe the flow of water through a rapid motion in a river? Explain

Watch Video Solution

35. Does it matter if one uses gauge instead of absolute pressures in applying Bernoulli's equation? Explain.

Watch Video Solution

36. lycerine flows steadily through a horizontal tube of length 1.5 m and radius 1.0 cm. If the amount of glycerine collected per second at one end is 4.0 x 10-3 kg s-1, what is the pressure difference between the two ends of the tube? Density of glycerine = 1.3 X 103 kg m-3 and viscosity of glycerine = 0.83 N s m-2 to

Watch Video Solution

37. a charge Q is divided into two parts of q and Q – q. If the coulomb repulsion between them when they are separated is to be maximum, the ratio of Q/q should be

A. 2:1

B. 1/2

C. 4:1

D. 1/4

Answer: A

View Text Solution

38. Two similar spheres having +Q and -Q charges are kept at a certain distance. F force acts between the two. If at the middle of two spheres, another similar sphere having +Q charge is kept, then it experiences a force in magnitude and direction as

A. zero having no direction.

B. 8F towards +Q charge.

C. 8F towards -Q charge.

D. 4F towards +Q charge

Answer: C

View Text Solution

39. n a test experiment on a model airplane in a wind tunnel, the flow speeds on the upper and lower surfaces of the wing are 70 m s-1 and 63 m s-1 respectively. What is the lift on the wing if its area is 2.5 m2 ? Take the density of air to be 1.3 kg m-3.

Watch Video Solution

40. What is the pressure inside the drop of mercury of radius 3.00 mm at room temperature ? Surface tension of mercury at that temperature (20 °C) is 4.65 x 10-1 N m_1. The atmospheric pressure is 1.01 x 105 Pa. Also give the excess pressure inside the drop.

Watch Video Solution

41. A U-shaped wire is dipped in a soap solution and removed. The thin soap film formed between the wire and the light slider supports a weight of 1.5 x 10-2 N (which includes the small weight of the silder). The length of the silder is 30 cm. What is the surface tension of the film ?

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TEXTUAL QUESTIONS SOLVED (NUMERICAL QUESTIONS)

1. The position vectors particle has length 1m and makes 30° with the x-axis. What are the lengths of the x and y components of the position vector?

Watch Video Solution

2. A particle has its position moved from $\overrightarrow{r_1} = 3\hat{i} + 4\hat{j}$ to $\overrightarrow{r_2} = \hat{i} + 2\hat{j}$. Calculate the displacment vector $\left(\Delta \overrightarrow{r}\right)$ and draw the

$\overrightarrow{r_1}, \overrightarrow{r_2}$ and $\Delta \overrightarrow{r}$ vector in a two dimensional Cartesian coordinate system.

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3. Calculate the average velocity of the particle whose position vector changes from $\overrightarrow{r_1} = 5\hat{i} + 6\hat{j}$ to $\overrightarrow{r_2} = 2\hat{i} + 3\hat{j}$ in a tine 5 second.

Watch Video Solution

4. Convert the vector $\overrightarrow{r} = 3\hat{i} + 2\hat{j}$ into a unit vector.

Watch Video Solution

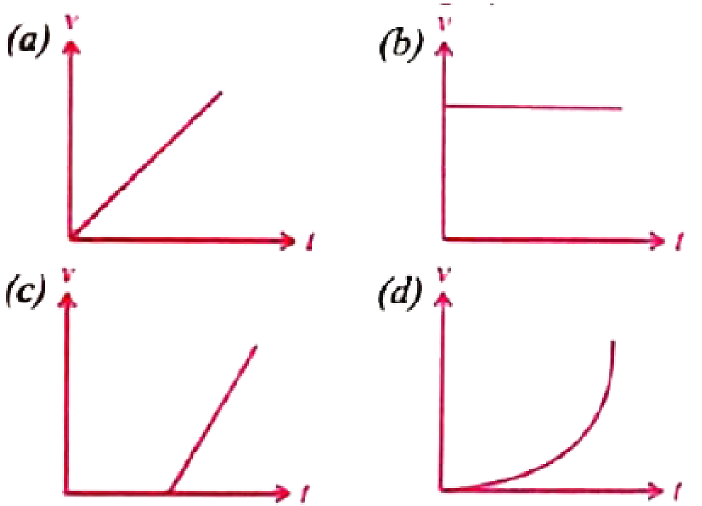
5. What are the resultants of the vector product of two given vectors. Given by $\overrightarrow{A} = 4\hat{i} - 2\hat{j} + \hat{k}$ and $\overrightarrow{B} = 5\hat{i} + 3\hat{j} - 4\hat{k}$

Watch Video Solution

6. An object at an angle such that the horizontal range is 4 time of the maximum height. What is the angle of projection of the object?

Watch Video Solution

7. The following graphs represent velocity-time graph. Identify what kind of motion a particle undergoes in each graph



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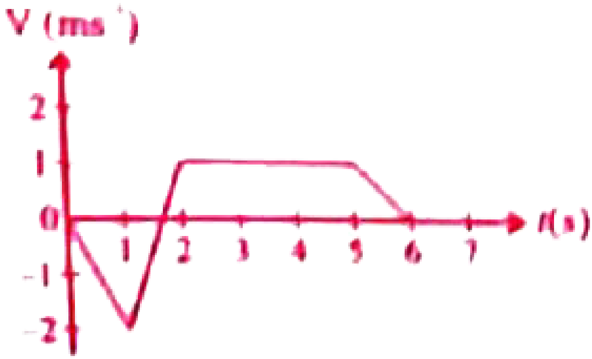
8. The following velocity-time graph represents a particle moving in the positive x-direction . Analyse its motion from 0 to 7s . Calculate the displacement covered and distance travelled by the particle from 0 to 2s



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9. A particle is projected at an angle of θ with respect to the horizontal direction. Match the following for the above motion.

(a) V_x — decrease and increases

(b) V_y — remains constant

(c) $\text{Acceleration - varies}$

(d) $\text{Position vector} \quad - \quad \text{remains downward}$

A. v_x- decreases and increases

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D. Position vector - remains downward

Watch Video Solution

10. A water fountain on the ground sprinkles water all around it. If the speed of the water coming out of the fountain is v. Calculate the total area around the fountain that gets wet.

Watch Video Solution

11. Complete the table.

No.	Type of fruits	Common Name	Edible Part
1.	Nut	Anacardium	....
2.	....	Sunflower	....
3.	Aggregate	....	....

Watch Video Solution

12. The resultant of two vectors A and B is perpendicular to vector A and its magnitude is equal to half of the magnitude of vector B . Then the angle between A and B is :

(a) 30° (b) 45°

(c) 150° (d) 120°

A. 30°

B. 45°

C. 150°

D. 120°

Answer: Given: Resultant of $\overrightarrow{A} \& \overrightarrow{B}$ is perpendicular to Ä and magnitude of resultant $(C) = \frac{1}{2}\overrightarrow{B}$ and $\alpha = 90^\circ$

Watch Video Solution

13. Compare the components for the following vector equations

(a) $T\hat{j} - mg\hat{j} = ma\hat{j}$ (b) $\overrightarrow{T} + \overrightarrow{F} = \overrightarrow{A} + \overrightarrow{B}$

© $\overrightarrow{T} - \overrightarrow{F} = \overrightarrow{A} - \overrightarrow{B}$ (d) $T\hat{j} + mg\hat{j} = ma\hat{j}$

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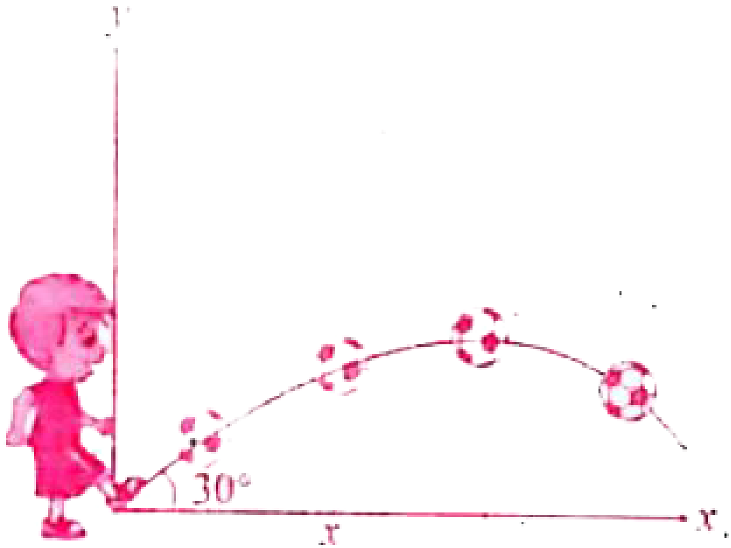
Find out whether ball reaches the goal post



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18. If an object is thrown horizontally with an initial speed $10\,\mathrm{ms}^{-1}$ from the top of a building of height 100 m. What is the horizontal distance covered by the particle.

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19. An object is executing uniform circular motion with an angular speed of $\frac{\pi}{12}$ radian per second. At $t = 0$, the object starts at an angle$\theta = 0$. What is the angular displacement of the particle after 4s?

Watch Video Solution

20. Consider the x-axis as representing east, the y-axis as north and z-axis as vertically upwards. Give the vector representing each of the following points .

5 m north east and 2 m up,

A. 5 m north east and 2 m up

B. 4 m south east and 3 m up

C. 2 m north west and 4 m up

D.

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21. The moon is orbiting the Earth approximately in 27 days, what is the angle transversed by the Moon per day?

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33. The following table gives the range of a particle when thrown on different planets. All the particles are thrown at the same angle with the horizontal and with the same initial speed. Arrange the planets in ascending order according to their acceleration due to gravity, (g value).

View Text Solution

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ADDITIONAL QUESTIONS SOLVED (SHORT ANSWER QUESTIONS (1 MARK))

1. What is meant by Frame of reference?

Watch Video Solution

2. What are the types of motion?

Watch Video Solution

3. Define linear motion. Give example.

Watch Video Solution

4. What is circular motion? Give example.

Watch Video Solution

5. Define rotational motion. Give example.

Watch Video Solution

6. Define vibratory motion. Give example

Watch Video Solution

7. Define one dimensional motion . Give examples .

Watch Video Solution

8. Define two dimensional motion . Give examples .

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9. Define three dimensional motion . Give examples .

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10. Write about the properties of components of vectors.

Watch Video Solution

11. Give an example for scalar product of two vectors.

Watch Video Solution

12. Write a short note on vector product between two vectors.

Watch Video Solution

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Watch Video Solution

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25. What are the examples of projectile motion?

Watch Video Solution

26. Define projectile motion .

Watch Video Solution

27. What is time of flight?

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28. Under what condition is the average velocity equal the instantaneous velocity?

Watch Video Solution

29. Draw position time graph of two objects, A & B moving along a straight line, when their relative velocity is zero.

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30. suggest a situation in which an obiect is accelerated and have constant speed.

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31. Two balls of different masses are thrown vertically upward with same initial velocity Maximum heights attained by them are h_1 and h_2 respectively, what is h_1 / h_2?

Watch Video Solution

32. A car moving with velocity of $50 kmh^{-1}$ on a straight road is ahead of a jeep moving with Velocity $75 kmh^{-1}$. How would the relative velocity be altered if jeep is ahead of car?

Watch Video Solution

33. Which of the two-linear velocity or the linear acceleration gives the direction of motion of a body?

Watch Video Solution

34. Will the displacement of a particle change on changing the position of origin of the coordinate system?

Watch Video Solution

35. If the instantaneous velocity of a particle is zero, will its instantaneous acceleration be necessarily zero?

Watch Video Solution

36. A projectile is fired with kinetic energy 1kJ. If the range is maximum, what is its kinetic energy, at the highest point ?

Watch Video Solution

37. Write an example of zero vector.

Watch Video Solution

38. State the essential condition for the addition of vectors.

Watch Video Solution

39. When is the magnitude of (A+B) equal to the magnitude of (A-B)?

Watch Video Solution

40. What is the maximum number of components into which a vector can be resolved ?

Watch Video Solution

41. A body projected horizontally moves with the same horizontal velocity although it moves under gravity. Why?

Watch Video Solution

42. What is the angle between velocity and acceleration at the highest point of a projectile motion?

Watch Video Solution

43. When does (i) height attained by a Projectile is maximum? and (ii) horizontal range is maximum?

Watch Video Solution

44. What is the angle between velocity vector and acceleration vector in uniform circular motion?

Watch Video Solution

45. A particle is in clockwise uniform circular motion the direction of its acceleration is radially inward. If sense of rotation or particle is anti-clockwise then what is the direction of its acceleration?

Watch Video Solution

46. A train is moving on a straight track with acceleration a. A passenger drops a stone. What is the acceleration of stone with respect to passenger?

Watch Video Solution

47. What is the average value of acceleration vector in uniform circular motion over one cycle?

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48. Does a vector quantity depends upon frame of reference chosen?

Watch Video Solution

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86. If the instantaneous velocity of a particle is zero, will its instantaneous acceleration be necessarily zero?

Watch Video Solution

87. What is the cause of quantisation of electric charge?

View Text Solution

88. What does $q1 + q2 = 0$ signify?

View Text Solution

89. Two insulated charged copper spheres A and B of identical size have charges qA and qB respectively. A third sphere C of the same size but uncharged is brought in contact with the first and then in contact with the second and finally removed from both. What are the new charges on A and B1

View Text Solution

90. When does a charged ring behave as a point charge?

View Text Solution

91. What does the additive nature of electric charge mean?

View Text Solution

92. What causes the charging of an object?

View Text Solution

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ADDITIONAL QUESTIONS SOLVED (SHORT ANSWER QUESTIONS - 1 (3 MARKS))

1. Is the acceleration of a particle in circular motion not always towards the centre? Explain.

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2. Draw (a) acceleration - time (b) velocity - time (c) position - time graphs representing motion of an object under free fall. Neglect air resistance.

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3. Match the columns

1.	J.J. Thomson	(a)	Atomic model for hydrogen atom
2.	Rutherford	(b)	Theoretical atom model
3.	Geiger and Marsden	(c)	Nucleus
4.	Neils Bohr	(d)	Scattering of alpha particles

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4. For an object projected upward with a velocity v_0 which comes back to the same point after some time, draw

(i) Acceleration-time graph

(ii) Position-time graph

(iii) Velocity-time graph

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5. The acceleration of a particle in ms^{-1} is given by $a = 3t^2 + 2t + 2$ where timer is in second If the particle starts with a velocity $v = 2ms^{-1}$ at t=0 then find the velocity at the end of 2s.

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6. At what angle do the two forces (P+Q) and (P-Q) act so that the resultant is $\sqrt{3P^2 + Q^2}$?

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7. A car moving along a straight highway with a speed of 126 kilometre per hour is brought to a stop within a distance of 200m. What is the retardation of the car (assumed uniform) and how long does it taken for the car to stop?

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8. Is the acceleration of a particle in circular motion not always towards the centre?

Explain.

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9. Estimate the mean free path and collision frequency of a nitrogen molecule in a cylinder containing nitrogen at 2.0 atm and temperature 17ºC. Take the radius of a nitrogen molecule to be roughly 1.0 A. Compare the collision time with the time the molecule moves freely between two successive collisions (Molecular mass of N2 = 28.0 u).

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10. The velocity time graph for a particle is shown in figure. Draw acceleration time graph from it

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11. For an object projected upward with a velocity v_0 which comes back to the same point after some time, draw

(i) Acceleration-time graph

(ii) Position-time graph

(iii) Velocity-time graph

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12. Three vessels of equal capacity have gases at the same temperature and pressure. The first-vessel contains neon (monoatomic), the second contains chlorine (diatomic), and the third contains uranium hexafluoride (polyatomic). Do the vessels contain an equal number of respective molecules? Is the root mean square speed of molecules the same in the three cases? If not, in which case is v_{rms} the largest?

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13. Two metallic spheres having same shape and size, but one of Cu and other of Al, are both placed in an identical electric field. In which metallic sphere will more charge be induced?

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14. Why does a nylon or plastic comb get electrified on combing or rubbing but a metal spoon does not?

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ADDITIONAL QUESTIONS SOLVED (LONG ANSWER QUESTIONS)

1. Explain the types of motion with example

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2. What are the different types of vectors?

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3. Explain the concept of relative velocity in one and two dimensional motion.

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4. Shows that the path of horizontal projectile is a parabola and derive an expression for (i) Time of flight (ii) Horizontal range (iii) resultant relative and any instant (iv) speed of the projectile when it hits the ground?

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5. Derve the relation between tangential acceleration and angular acceleration.

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6. Distinguish between an insulator (dielectric) and a conductor.

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7. one end of a copper wire is connected to a neutral pith ball and other end to a negatively charged plastic rod. What will be the charge acquired by a pith ball?

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8. A cylinder of radius R and length L is placed in a uniform electric field E parallel to the cylinder axis. The total flux for the surface of the cylinder is given by

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9. Estimate the total number of air molecules (inclusive of oxygen, nitrogen, water vapour and other constituents) in a room of capacity

25.0 m3 at a temperature of 27°C and 1 atm pressure.

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10. An oxygen cylinder of volume 30 liters has an initial gauge pressure of 15 atm and a temperature of 27°C. After some oxygen is withdrawn from the cylinder, the gauge pressure drops to 11 atm and its temperature drop to 17°C. Estimate the mass of oxygen taken out of the cylinder. (R = 8.31 J mol-1 K_1, molecular mass of O2 = 32 u).

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