MCQ 2019-20

PHYSICS
CLASS - XI (SCIENCE)

Important Instructions:

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars with blue/black pen only.
2. The test of 3.15 hours duration and Test Booklet, contain 120 question. Each question carries 4 mark. For each correct response, the candidate will get 4 marks. For each incorrect response, 1 mark will be deducted from the total scors. The maximum Marks are 480.
4. Use only blue/black ball point pen to write particulars on this page/ marking response.
5. Rough work to be done on the space provided for this purpose in the Test Booklet only.
6. On completion of test the candidates must handover the Answer Sheet to the invigilator before leaving the room. The candidate are allowed to carry away this Test Booklet with them.
7. The candidate should ensure that the Answer Sheet is not folded. Do not make any stray mark on Answer Sheet. Do not write your Roll No. Anywhere else expect in the specified space in the Test Booklet/ Answer Sheet.
8. Use of White fluid for correction is Not permissible on the Answer Sheet.
9. Black Paper, clipboards, log tables, calculators, mobile or any electronics storage device is NOT permissible in the examination room.

Test Duration : 3.15 Hours **Date : ______________**

Name of Candidate (in Capitals) : ____

Roll Number (in Figures) : ____

Roll Number (in Words) : ____

Candidate's Signature : ________________________ **Invigilator's Signature** ________________________

1. 1 ns is defined as
(A) 10^{-9}s of Kr-clock of 1650763.73 oscillations
(B) 10^{-9}s of Kr-clock of 652189.63 oscillations
(C) 10^{-9}s of Cs-clock of 1650763.73 oscillations
(D) 10^{-9}s of Kr-clock of 9192631770 oscillations

2. If the unit of force is 1 kilonewton, the length is 1 km and time 100s, what will be the unit of mass?
(A) 1,000 kg (B) 1 kg
(C) 10,000 kg (D) 100 kg

3. Identify the pair whose dimensions are equal.
(A) torque and work (B) stress and energy
(C) force and stress (D) force and work

4. Out of the following pairs, which one does not have identical dimensions
(A) Moment of inertia and moment of a force
(B) Work and torque
(C) Angular momentum and Plank's constant
(D) Impulse and momentum

5. Out of the following four dimensional quantities, which one qualifies to be called a dimensional constant?
(A) Acceleration due to gravity
(B) Surface tension of water
(C) Weight of a standard kilogram mass
(D) The velocity of light in vacuum.

6. Which of the following units denotes the dimensions ML^2Q^{-2}, where Q denotes the electric charge?
(A) $[ML^2T^2]$ (B) $[ML^2T^{-2}]$
(C) $[M^2L^2T^{-2}]$ (D) $[MLT^{-1}]$

7. $[ML^2t^{-2}]$ are dimensions of
(A) force (B) moment of force
(C) momentum (D) power

8. The respective number of significant figures for the number 23.023, 0.0003 and 2.1×10^{-3} are
(A) 4, 4, 2 (B) 5, 1, 2
(C) 5, 1, 5 (D) 5, 5, 2

9. Resistance of a given wire is obtained by measuring the current flowing in it and the voltage difference applied acorss it. If the percentage errors in the measurement of the current and the voltage difference are 3% each, then error in the value of resistance of wire is
(A) 6% (B) zero
(C) 1% (D) 3%

10. The period of oscillation of a simple pendulum is $T = 2\pi\sqrt{\frac{L}{g}}$. Measured value of L is 20.0 cm known to 1 mm accuracy and time for 100 oscillations of the pendulum is found to be 90 s using a watch of 1 s resolution. The accuracy in the determination of g is
(A) 2% (B) 3%
(C) 1% (D) 5%

11. A bullet fired into a fixed target loses half of its velocity after penetrating 3 cm. How much further will it penetrate before coming to rest assuming that it faces constant resistance in motion.
(A) 1.5 cm (B) 1.0 cm
(C) 3.0 cm (D) 2.0 cm

Space for Rough Work

12. A car moving with the speed of $50 Kmh^{-1}$ can be stopped by brakes after alteast 6 m. If the same car is moving at a speed of $100 kmh^{-1}$, the minimum stopping distance is

(A) 12 m (B) 18 m

(C) 24 m (D) 6 m

13. An automobile travelling with a speed of 60 kmh^{-1} can brake to stop within a distance 20 m. If the car is going twice as fast i.e., 120 kmh^{-1}, the stopping distance will be

(A) 20 m (B) 40 m

(C) 60 m (D) 80 m

14. Speeds of two identical cars are u and $4u$ at a specific instant. The ratio of the respective distance at which the two cars are stopped from that instant is

(A) 1 : 1 (B) 1 : 4

(C) 1 : 8 (D) 1 : 16

15. If a body loses half of its velocity on penetrating 3 cm in a wooden block, then how much will it penetrate more before coming to rest?

(A) 1 cm (B) 2 cm

(C) 3 cm (D) 4 cm

16. A car, starting from rest, accelerates at the rate f through a distance s, then continues at constant speed for time t and then decelerates at the rate $f/2$ to come to rest. If the total distance traversed is 5s, then

(A) $s = ft$ (B) $s = \frac{1}{6} ft^2$

(C) $s = \frac{1}{2} ft^2$ (D) $s = \frac{1}{4} ft^2$

17. The relation between time t and distance x is $t = ax^2 + bx$, where a and b are constants. The acceleration is

(A) $-2abv^2$ (B) $-2bv^3$

(C) $-2av^3$ (D) $-2av^2$

18. A particle located at $x = 0$ at time t = 0, starts moving along the positive x-direction with a velocity v that varies as $v = \alpha\sqrt{x}$. The displacement of the particle varies with time as

(A) $t^{1/2}$ (B) t^3

(C) t^2 (D) t

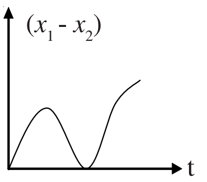
19. The velocity of a particle is $v = v_0 + gt + ft^2$. If its pisition is $x = 0$ at t = 0, then its displacement after time (t = 1) is

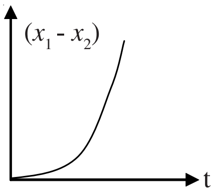
(A) $v_0 + \frac{g}{2} + f$ (B) $v_0 + 2g + 3f$

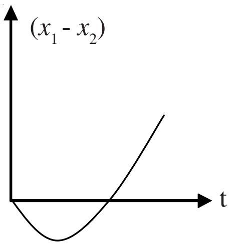
(C) $v_0 + \frac{g}{2} + \frac{f}{3}$ (D) $v_0 + g + f$

Space for Rough Work

20. A body is at rest at $x = 0$, it starts moving in the positive x-direction with a constant acceleration. At the same instant another body passes through $x = 0$ moving in the positive x-direction with a constant speed. The positive of the first body is given by $x_1(t)$ after time t and that of second body by $x_2(t)$ after the same time interval. Which of the following graps correctly descrives $(x_1 - x_2)$ as a function of time t ?

(A)


(B)


(C)


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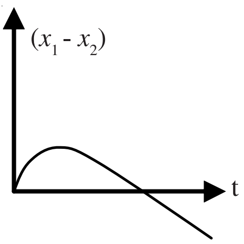


21. Two force are such that the sum of their magnitudes is 18 N and their resultant has magnitude 12 N and is perpendicular to the smaller force. Then the magnitudes of the forces are

(A) 12 N, 6 N (B) 13 N, 5 N

(C) 10 N, 8 N (D) 16 N, 2 N

22. A particle is moving eastward with a velocity of $5ms^{-1}$. In 10 s, the velocity of the particle changes to $5ms^{-1}$ nothward. The average accleration in this time is

(A) $\frac{1}{\sqrt{2}}ms^{-2}$ towards north-west

(B) $\frac{1}{\sqrt{2}}ms^{-2}$ towards north-east

(C) $\frac{1}{2}ms^{-2}$ towards north-west

(D) zero

23. The coordinates of a moving particle at any time t are given by $x = \alpha t^3$. The speed of the particle at time t is given by

(A) $3t\sqrt{\alpha^2+\beta^2}$ (B) $3t^2\sqrt{\alpha^2+\beta^2}$

(C) $t^2\sqrt{\alpha^2+\beta^2}$ (D) $\sqrt{\alpha^2+\beta^2}$

24. A vector $\vec{A}$ is rotated by a small angle $\Delta\theta$ radians $(\Delta\theta << 1)$ to get new vector $\vec{B}$. In that cases $|\vec{B}-\vec{A}|$ is

(A) $|\vec{A}|\Delta\theta$ (B) $|\vec{A}|\Delta\theta - |\vec{A}|$

(C) $|\vec{A}|\left(1-\frac{\Delta\theta^2}{2}\right)$ (D) 0

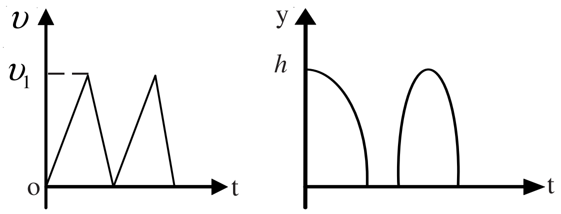
25. A particle has an initial velocity of $3\hat{i}+4\hat{j}$ and an acceleration of $0.4\hat{i}+0.3\hat{j}$. Its speed after 10 s is.

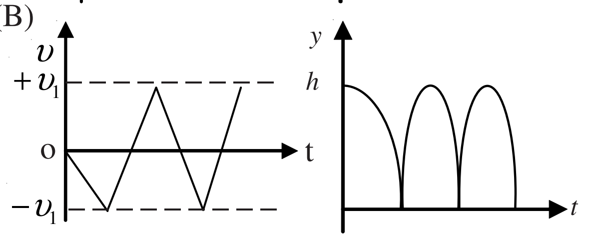
(A) $7\sqrt{2}$ units (B) 7 units

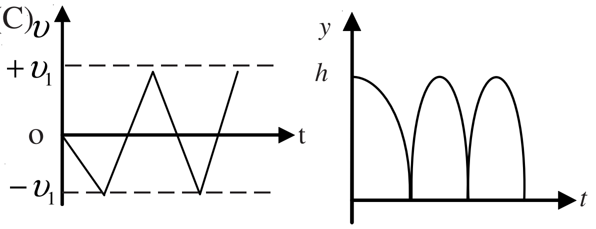
(C) 8.5 units (D) 10 units

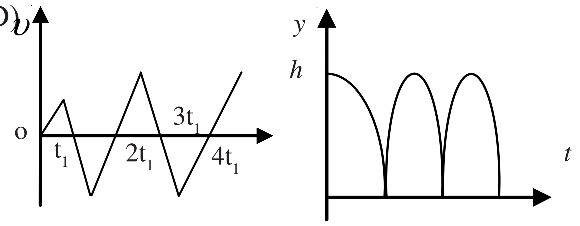
Space for Rough Work

26. Consider a rubber ball freely falling from a height h = 4.9 m onto a horizontal elastic plate. Assume that the duration of collision is negligible and the collision with the plate of totally elastic. Then the velocity as a function of time and the height as function of time will be

(A)


(B)


(C)


(D)


27. A particle is moving with velocity $\vec{\upsilon} = K(y\hat{i} + x\hat{i})$, where K is a constant. The general equation for its path is

(A) $y^2 = x^2 + \text{constant}$ (B) $y = x^2 + \text{constant}$

(C) $y^2 = x + \text{constant}$ (D) $xy = x + \text{constant}$

28. A boy playing on the roof of a 10 m high building throws a ball with a speed of 10 ms^{-1} at an angle 30^o with the horizontal. How far from the throwing point will the ball be at the height of 10 m from the ground?

Given that

$g = 10ms^{-2}$, $\sin 30^o = 1/2$, $\cos 30^o = \sqrt{3}/2$.

(A) 5.20 m (B) 4.33 m

(C) 2.60 m (D) 8.66 m

29. A projectile can have the same range R for two angles or projection. If t_1 and t_2 be the times of flight in the two cases, then the product of the two times of flight is directly proportional to

(A) 1 / R^2 (B) 1 / R

(C) R (D) R^2

30. A ball is thrown from a point with a speed υ_o at an angle of projection θ. From the same point and at the same instant, a person starts running with a constant speed $\upsilon_o/2$ to catch the ball. Will the person be able to catch the ball? If yes, what should be the angle of projection?

(A) Yes, 60^o (B) Yes, 30^o

(C) No (D) Yes, 45^o

Space for Rough Work

31. A rocket with a lift-off mass 3.5×10^4 kg is blasted upwards with an initial acceleration of 10 ms^{-2}. Then the initial thrust of the blast is

(A) $3.5\times10^5 N$ (B) $7.0\times10^5 N$

(C) $14.0\times10^5 N$ (D) $1.75\times10^5 N$

32. A block of mass m is connected to another block of mass *M* by a massless spring of spring constant *K*. The blocks are kept on a smooth horizontal plane. Initially the blocks are at are at rest and the spring is unstretched. Then, a constant force *F* starts acting on the block of mass to

(A) $\frac{mF}{M}$ (B) $\frac{(M+m)F}{M}$

(C) $\frac{mF}{(M+m)}$ (D) $\frac{MF}{(M+m)}$

33. A block of mass *M* is pulled along a horizontal frictionless surface by a rope of mass *m*. If a force *P* is applied at the needed of the rope, the force exerted by the rope on the block is

(A) $\frac{Pm}{(M+m)}$ (B) $\frac{Pm}{(M-m)}$

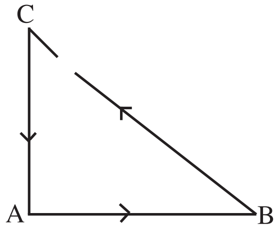
(C) P (D) $\frac{PM}{(M+m)}$

34. A particle of mass 0.3 kg is subjected to a force $F = -kx$ with $k = 15$ Nm^{-1}. What will be its initial acceleration, if it is released from a point 20 cm away from the origin?

(A) 3 m s^{-2} (B) 15 m s^{-2}

(C) 5 m s^{-2} (D) 10 m s^{-2}

35. Three forces start acing simultaneously on a particle moving with velocity $\vec{v}$. These forces are



represented in magnitude and direction by the three sides of a triangle ABC as shown in the figure. The particle will now move with velocity

(A) greater than $\vec{v}$

(B) $|\vec{v}|$ in the direction of the largest force BC

(C) $\vec{v}$, remaining unchanged

(D) less than $\vec{v}$

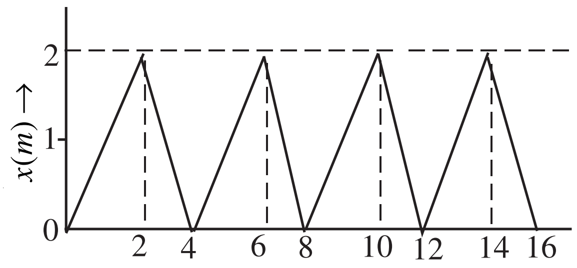
36. When force F_1, F_2 and F_3 are acting on a particle of mass m such that F_2 and F_3 are mutually prependicular, then the particle remains stationary. If the force F_1 is now removed, then the accleration of the particle is

(A) F_1/m (B) F_2F_3/mF

(C) $(F_2-F_3)/m$ (D) F_2/m

Space for Rough Work

37. The figure shows the position-time (x-t) graph of one-dimensional motion of a body of mass 0.4 kg. The magnitude of each impulse is



(A) 0.2 Ns (B) 0.4 Ns
(C) 0.8 Ns (D) 1.6 Ns

38. The dimensions of Planck's constant are
(A) $[ML^2T^2]$ (B) $[ML^2T^{-2}]$
(C) $[M^2L^2T^{-2}]$ (D) $[MLT^{-1}]$

39. A ball of mass 0.2 kg is thrown vertically upwards by applying a force by hand. If the hand moves 0.2 m while applying the force and the ball goes upto 2 m height further, find the magnitude of the force. Take g = 10 ms^{-2}.
(A) 20 N (B) 22 N
(C) 4 N (D) 16 N

40. A player caught a cricket ball of mass 150 g moving at a rate of 20 ms^{-1}. If the ball catching process is completed in 0.1s, the force on the blow exerted by the ball on the hand of the player is equal to
(A) 30 N (B) 300 N
(C) 150 N (D) 3 N

41. A machine gun fires a bullet of mass 40 g with a velocity 1,200 ms^{-1}. The man holding it, can exert a maximum force of 144 N on the gun. How many bullets can he fire per second at the most?
(A) One (B) Four
(C) Two (D) Three

42. A body of mass 3.513 kg is moving along the x-axis with a speed of 5.00 ms^{-1}. The magnitude of its momentum is
(A) 17.6 kg ms^{-1} (B) 17.565 kg ms^{-1}
(C) 17.56 kg ms^{-1} (D) 17.57 kg ms^{-1}

43. A lift is moving down with acceleration a. A man in the lift drops a ball inside the lift. The acceleration of the ball as observed by the man in the lift and a man standing stationary on the ground are respectively.
(A) g, g (B) g-a, g-a
(C) g-a, g (D) a, g

44. A light spring balance hangs from the hook of the other light spring balance and a block of mass M kg hangs from the former one. Then, the true statement about the scale reading is
(A) Both the scales read M kg each
(B) The scale of the lower one read M kg and of the upper one zero.
(C) The reading of the two scales can be anything but the sum of the readings will be M kg
(D) Both the scales read M / 2 kg.

Space for Rough Work

45. A spring balance is attached to the ceiling of a lift. A man hangs his bag on the spring and the spring balance read 49 N, when the lift is stationary. If the lift moves downward with an acceleration of 5 ms^{-2}, the reading of the spring balance will be

(A) 24 N (B) 74 N

(C) 15 N (D) 49 N

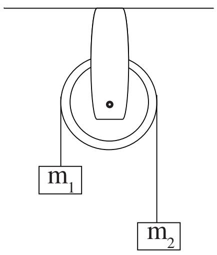
46. Three identical blocks of masses m = 2 kg are drawn by a force 10.2 N on a frictionless surface. What

is the tension (is N) in the string between the block B and C?

(A) 9.2 (B) 8

(C) 3.4 (D) 9.8

47. Two masses m_1 = 5 kg and m_2 = 4.5 kg tied to a string are hanging over a light over a light frictionless pulley. What



is the acceleration of the masses, when left free to move? (Given : g = 9.8 ms^{-2}).

(A) 0.2 ms^{-2} (B) 9.8 ms^{-2}

(C) 5 ms^{-2} (D) 4.8 ms^{-2}

48. A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (vertically). If the acceleration of the system is g/8, then the ratio of the masses m_2/m_1 is

(A) 8 : 1 (B) 9 : 7

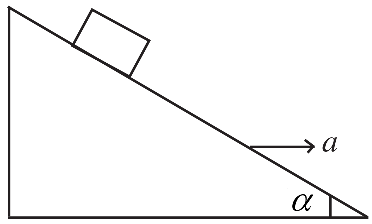
(C) 4 : 3 (D) 5 : 3

49. One end of massless rope, which posses over a massless and frictionless pulley P is tied to a took C, while the other end is free. Maximum tension that the rope hear is 640 N. With what value of maximum safe acceleration (in ms^{-2}) can a man of 40 kg climb on the rope? Take g = 10 ms^{-2}.

(A) 16 (B) 12

(C) 8 (D) 6

50. A block is kept on a frictionless inclined surface with angle of inclination α. The incline is given an



acceleration a to keep the block stationary. Then a is equal to

(A) $g / \tan\alpha$ (B) $g \operatorname{cosec}\alpha$

(C) g (D) $g \tan\alpha$

Space for Rough Work

51. When a rubber-band is stretched by a distance x, it exerts a restoring force of magnitude $F = ax + bx^2$, where a and b are constants. The work done n stretching the unstretched rubber by L is

(A) $aL^2 + bL^3$ (B) $\frac{1}{2}(aL^2 + bL^3)$

(C) $\frac{aL^2}{2} + \frac{bL^3}{3}$ (D) $\frac{1}{2}\left(\frac{aL^2}{2} + \frac{bL^3}{3}\right)$

52. A force $\vec{F} = (5\hat{i} + 3\hat{i} + 2\hat{k})N$ is applied over a particle which displaces it from its origin ot the point $\vec{r} = (2\hat{i} - \hat{j})$ m. The work done on the particle (in joule) is

(A) -7 (B) +7

(C) +10 (D) +13

53. An athlete in the Olympic games covers a distance of 100 m in 10 s. His kinetic energy can be estimated in the range

(A) 200 J - 500 J (B) $2\times10^5 J - 3\times10^5 J$

(C) 20,000 J - 50,000 J (D) 2000 J - 5000 J

54. A particle of mass 100 g is thrown vertically upwards with a speed of 5 ms^{-1}. The work done by the force of gravity during the time the particle goes up is

(A) 1.25 J (B) 0.5 J

(C) -0.5 J (D) -1.25 J

55. A ball whose kinetic energy is E, is projected at an angle of 45° to the horizontal. The kinetic energy of the ball at the highest point of its flight will be

(A) E (B) $E/\sqrt{2}$

(C) $E/2$ (D) zero

56. A particle is projected at an angle of 60° to the horizontal with a kinetic energy E. The kinetic energy at the highest point is

(A) E (B) $E/4$

(C) $E/2$ (D) zero

57. A particle moves in a straight line with retardation proportional to its displacement. Its loss of kinetic energy for any displacement x is proportional to

(A) x^2 (B) e^x

(C) x (D) $\log e^x$

58. The potential energy of a 1 kg particle free to move along the X-axis is given by

$$V(x) = \frac{x^4}{4} - \frac{x^2}{2} \text{ (in joule)}$$

The total mechanical energy of the particle is 2 J. Then the maximum speed (in ms^{-1})is

(A) $1/\sqrt{2}$ (B) 2

(C) $3/\sqrt{2}$ (D) $\sqrt{2}$

Space for Rough Work

59. A particle is moving in a circle of radius r under the action of a force $F = \alpha r^2$ which is directed towards centre of the circle. Total mechanical energy (kinetic energy + potential energy) of the particle (take potential energy = 0 for r = 0) is

(A) $\frac{1}{2}\alpha r^3$ (B) $\frac{5}{6}\alpha r^3$

(C) $\frac{4}{3}\alpha r^3$ (D) αr^3

60. Consider the following two statements :
(P) Linear momentum of a system of particles is zero.
(Q) Kinetic energy of a system of particle is zero.
Then
(A) P does not imply Q and Q does not imply P
(B) P implies Q but Q does not imply P
(C) P does not imply Q but B implies P
(D) P implies Q and Q implies P.

61. A car travels from A to B at a speed of 20 km/h and returns at a speed of 30 km/h. The average speed of the car for the whole enjouney is
(A) 5 km/h (B) 24 km/h
(C) 25 km/h (D) 50 km/h

62. A particle moves along the *x*-axis with a position given by the equation *x*(t) = 5+3t, where *x* is in metres and t is in seconds. The positive direction is east. Which of the following statements abou the particle is false?
(A) The particle is east of the origin at t = 0
(B) The particle is at rest at t = 0
(C) The particle's velocity is constant
(D) The particle's acceleration is constant

63. A particle moves in one dimension. The velocity is given $\upsilon(t) = c_2t^2 + c_1t + c_0$, where c_1 and c_2 are constants. What is the acceleration of the particle at time t = 1s?

(A) $c_1 + 2c_2$ (B) zero

(C) $c_1 + c_2$ (D) c_1

64. What are the units of the constant c_1 in the equation for $\upsilon(t)$ in the above question?
(A) length/time (B) length/time^3
(C) length (D) length/time^2

65. Which the usual notations, the following equations

$$s_{th} = u + \frac{1}{2}a(2t-1) \text{ is}$$

(A) only numerically correct
(B) only dimensionally correct
(C) both numerically and dimensionallty correct
(D) neither numerically nor dimensionally correct

66. What is the relation among displacement, time and acceleration in case of a body having uniform acceleration *f* ?

(A) $s = ut + \frac{1}{2}ft^2$ (B) $s = (u + f)t$

(C) $s = \upsilon^2 - 2fs$ (D) none of these

67. The motion of a particle is described by the equation u = at. The distance travelled by particle in first 4 s is
(A) 4*a* (B) 12*a*
(C) 6*a* (D) 8*a*

Space for Rough Work

68. The displacement x of a particle varies with time t as $x = ae^{-\alpha t} + be^{\beta t}$ where a, b, α and β are positive constants. The velocity of the particle will

(A) go on decreasing with time

(B) be independent of α and β

(C) drop to zero when $\alpha = \beta$

(D) go on increasing with time

69. A ball rolls up a slope. At the end of three seconds it velocity is 20 cm/s, at the end of eight second its velocity is 0. What is the average accleration from the third to eighth second?

(A) -2.5 cm/s^2 (B) -4.0 cm/s^2

(C) -5.0 cm/s^2 (D) -6.0 cm/s^2

70. The accleration 'a' of a particle starting from rest with time according to relation $a = \alpha t + \beta$. The velocity of the particle after a time 't' will be

(A) $\frac{\alpha t^2}{2} + \beta$ (B) $\frac{\alpha t^2}{2} + \beta t$

(C) $\alpha t^2 + \frac{1}{2}\beta t$ (D) $\frac{\alpha t^2 + \beta t}{2}$

71. A displacement vector is a

(A) change is position (B) velocity

(C) scalar (D) distance without scalar

72. A body moves 6 m north, 8 m east and 10 m vertically upwards, the resultant displacement from its initial position is

(A) $10\sqrt{2}$ m (B) 10 m

(C) $\frac{10}{\sqrt{2}} m$ (D) 20 m

73. When $\vec{A}.\vec{B} = -|\vec{A}||\vec{B}|$, then

(A) $\vec{A}$ and $\vec{B}$ are perpendicular to each other

(B) $\vec{A}$ and $\vec{B}$ act in the same direction

(C) $\vec{A}$ and $\vec{B}$ act in the opposite direction

(D) $\vec{A}$ and $\vec{B}$ can act in any direction

74. If the angle between the vectors $\vec{A}$ and $\vec{B}$ is θ, the value of the product $(\vec{B} \times \vec{A}).\vec{A}$ is equal to

(A) $BA^2 \cos\theta$ (B) $BA^2 \sin\theta$

(C) $BA^2 \sin\theta \cos\theta$ (D) zero

75. For vector $\vec{A}$ and $\vec{B}$ making an angle 'θ', which one of the following relations is correct?

(A) $\vec{A} \times \vec{B} = \vec{B} \times \vec{A}$ (B) $\vec{A} \times \vec{B} = AB\sin\theta$

(C) $\vec{A} \times \vec{B} = AB\cos\theta$ (D) $\vec{A} \times \vec{B} = -\vec{B} \times \vec{A}$

76. The direction of $\vec{A}$ is vertically upward and direction $\vec{B}$ is in north direction. The direction of $\vec{A} \times \vec{B}$ will be

(A) western direction (B) eastern direction

(C) at 45o upward in north

(D) vertically downward

77. If the angle between vectors $\vec{A}$ and $\vec{B}$ is 120^o, its resultant $\vec{C}$ will be

(A) $|\vec{C}| = |\vec{A} - \vec{B}|$ (B) $|\vec{C}| < |\vec{A} - \vec{B}|$

(C) $|\vec{C}| > |\vec{A} - \vec{B}|$ (D) $|\vec{C}| = |\vec{A} + \vec{B}|$

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78. If $\vec{A} = \vec{A} + \vec{B} + \vec{C}$ and the values of $\vec{A}, \vec{B}$ and $\vec{C}$ are 13, 12 and 5 respectively, then the angle between $\vec{A}$ and $\vec{C}$ will be

(A) $\cos^{-1}(5/13)$ (B) $\cos^{-1}(13/12)$

(C) $\pi/2$ (D) $\sin^{-1}(5/12)$

79. The value of p so that vectors $2\hat{i} - \hat{j} + \hat{k}, +2\hat{j} - 3\hat{k}$ and $3\hat{i} - p\hat{j} + 5\hat{k},$ are coplanar should be

(A) 16 (B) -4

(C) 4 (D) -8

80. The position vector of a point is $\vec{R} = x\hat{i} + y\hat{i} + z\hat{k}$ and another vector is $\vec{A} = 3\hat{i} + 2\hat{i} + 5\hat{k}$. Which of the mathematical relations is correct?

(A) $\bar{v} = (\vec{A}.\vec{B}) = 0$ (B) $\bar{v} = (\vec{A}.\vec{B}) = \vec{A}$

(C) $\bar{v} = (\vec{A}.\vec{B}) = \vec{R}$ (D) none of these

81. A body is at rest on the surface of the earth. Which of the following statements is correct?

(A) No force is acting on the body

(B) Only weight of the body acts on it

(C) Net downward force is equal to the net upward force

(D) None of the above statements is correct

82. The dimensions of action are

(A) $[M^2LT^{-3}]$ (B) $[MLT^{-1}]$

(C) $[MLT^{-2}]$ (D) $[ML^2T^{-1}]$

83. If two forces of 5 N each are acting along X- and Y-axes, then the magnitude and direction of resultant is

(A) $5\sqrt{2}, \pi/3$ (B) $5\sqrt{2}, \pi/4$

(C) $-5\sqrt{2}, \pi/3$ (D) $-5\sqrt{2}, \pi/4$

84. If two forces are acting at a point such that the magnitude of each force is 2 N and the magnitude of their resultant is also 2 N, then the angle between the two forces are

(A) 120^o (B) 60^o

(C) 90^o (D) 0^o

85. A body of mass 8 kg is moved by a force F = $3x$ N, where x is the distance covered. Initial position is x = 2 m and the final position is x = 10 m. The initial speed is zero. The final speed is

(A) 6 m/s (B) 12 m/s

(C) 18 m/s (D) 14 m/s

86. A body of mass 5 kg starts from the origin with an inital velocity $it = (30\hat{i} + 40\hat{j}) m/s.$ If a constant force $(-6\hat{i} - 5\hat{j})$ N acts on the body, the time in which the y-component of the velocity beocmes zero is

(A) 5 s (B) 20 s

(C) 40 s (D) 80 s

87. A student to answer a question on Newton's laws of motion attemps to pull himself up by tugging on his hair. He will not succed

(A) as the force exerted is small

(B) the frictional force while gripping, is small

(C) Newton's law of inertia is not applicable to living beings

(D) as the force applied is internal to the system

88. Dimesions of impulse are same as that of

(A) force (B) Change in momentum

(C) energy (D) acceleration

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89. Momentum is closely related to

(A) Change in force (B) impulse

(C) velocity (D) kinetic energy

90. A particle is moving in a circle with uniform speed υ. In moving from a point to another diametrically opposite point,

(A) the momentum changes by $m\upsilon$

(B) the momentum changes by 2 $m\upsilon$

(C) the kinetic energy changes by $\left({}^{1}/_{2}\right)m\upsilon^2$

(D) the kinetic energy changes by $m\upsilon^2$

91. A body moves a distance of 10 m under the action of force F = 10N. If the work done is 25 J, the angle which the force makes with the direction of motion is

(A) 0^o (B) 30^o

(C) 60^o (D) none of these

92. What is $\vec{F}.\vec{ds}$?

(A) Torque (B) Impulse

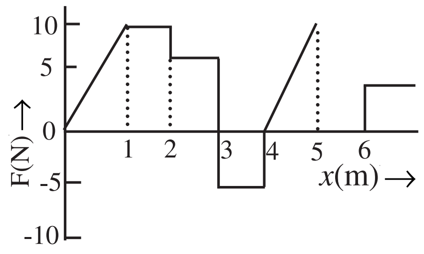
(C) Momentum (D) Work

93. A particle move under a force F = CX from X = 0 to X = X_1. The work done is

(A) CX_1^2 (B) $CX_1^2/2$

(C) zero (D) CX_1^3

94. The relationship between the force F and position x of a body is as shown in figure. The work



done is displacing the body from x = 1 m to x = 5 m will be

(A) 30 J (B) 15 J

(C) 25 J (D) 20 J

95. A force $F=(2+x)N$ acts on a particle in the x-direction. The work done by this force during a displacement from x = 1.0 m to x = 2.0 m is

(A) 2.1J (B) 2.5J

(C) 3.5J (D) 4.5J

96. Two bodies of mass m and 4 m have equal kinetic energy. What is the ratioi of their momentum?

(A) 1 : 4 (B) 1 : 2

(C) 1 : 1 (D) 2 : 1

97. If momentum decreases by 20%, K.E. will decrease by

(A) 40% (B) 36%

(C) 18% (D) 8%

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98. A hockey player receives a corner shot at a speed of 15 m/s at an angle of 30^o with the *y*-axis and then shoots the ball of mass 100 g along the positive *x*-axis with a speed of 30 m/s. If it remains in contact with the hockey stick for 0.01s, the force imparted to the ball in the *x*-direction is

(A) 281.25 N (B) 187.5 N
(C) 562.5 N (D) 375 N

99. Two bodies A and B having mass m and M respectively possess same kinetic energy. Given that M>m. If p_A and p_B be their moments, then which of the following statements is true?

(A) $p_A = p_B$ (B) $p_A > p_B$
(C) $p_A < p_B$ (D) It cannot be predicted

100. A gun of mass M fires a bullet of mass m with maximum spoeed υ. Given that m < M. The kinetic energy of the gun will be

(A) $\frac{1}{2}m\upsilon^2$ (B) $\frac{1}{2}M\upsilon^2$
(C) more than $\frac{1}{2}M\upsilon^2$ (D) less than $\frac{1}{2}M\upsilon^2$

101. An unloaded car moving with velocity u on a frictionless road can be stopped in a distance s. If passengers add 40% to its weight and braking force remains the same, the stopping distance at velocity u is now

(A) 1.4 s (B) $\sqrt{1.4}s$
(C) $(1.4)^2$s (D) $\frac{1}{1.4}s$

102. Which is odd out?

(A) Displacement (B) Momentum
(C) Potential energy (D) Torque

103. The dimension of k in the equation $W = \frac{1}{2}kx^2$ is

(A) $[M^1L^0T^{-2}]$ (B) $[M^0L^1T^{-1}]$
(C) $[M^1L^1T^{-2}]$ (D) $[M^1L^0T^{-1}]$

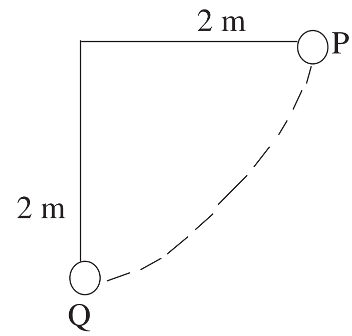
104. The work done is stretching a spring of force constant k from length l_1 to l_2 is

(A) $k(l_{21}^2 - l_1^2)$ (B) $\frac{1}{2}k(l_2^2 - l_1^2)$
(C) $k(l_2 - l_1)$ (D) $\frac{k}{2}(l_2 + l_1)$

105. When a spring is stretched by 2 cm, it stores 100 J of energy. If it is stretched further by 2 cm, the stored energy will be increased by

(A) 100 J (B) 200 J
(C) 300 J (D) 400 J

106. The bob of a pendulum of length 2 m lies at *P*. When it reached *Q* it loses 10% of its total energy due to air resistance.



The velocity at *Q* is

(A) 6 m/s (B) 1 m/s
(C) 2 m/s (D) 8 m/s

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107. The dimensions of the quantity hv/c, where h is Plank's constant, v is the frequency and c is the velocity of light are

(A) $[MT^{-1}]$ (B) $[MLT^{-1}]$

(C) $[MLT^{-2}]$ (D) $[MT^2T^2]$

108. A constant force F is pushing a 5 kg mass on a horizontal surface at a constant velocity of 2 m/s. The coefficient of friction between the surface and the mass is 0.3 (Take $g = 10$ m/s^2)

If F acts along the direction of motion, the rate at which F is doing work (in watt)

(A) 3 (B) 6

(C) 10 (D) 30

109. A car of mass m is driven with an acceleration a along a straight level road against a constant external resistive force R. When the velocity of the care is υ, the rate at which engine of the car is doing work, will be

(A) R.υ (B) ma.υ

(C) (R + ma).υ (D) (ma - R).υ

110. When a particle is moving in vertical circle,

(A) its radial and tangential accelerations both are constant

(B) its radial and tangential accelerations both are varying

(C) its radial acceleration is constant but tangential acceleration is varying

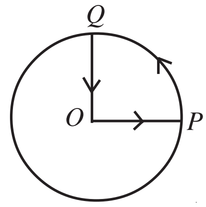
(D) its radial acceleration is verying but tangential acceleration is constant

111. A particle moves along a parabolic path $y = 9x^2$ in such a way that the *x*-component of velocity remains constant and has a value $\frac{1}{3} m/s$. The acceleeration of the projectile is

(A) $\frac{1}{3}\hat{j} m/s^2$ (B) $3\hat{j} m/s^2$

(C) $\frac{2}{3}\hat{j} m/s^2$ (D) $2\hat{j} m/s^2$

112. A cyclist starts from the centre O of a circular park radius 1 km, reaches the edge P of the park, then cycles along the circumference and returns to the centre along *Q*O as shown in the figure. If the round trip takes 10 min, the net displacement and average speed of the cyclist (in metre kilometre per hour) are



(A) 0, 1 (B) $\frac{\pi + 4}{2}, 0$

(C) $21.4, \frac{\pi + 4}{2}, 0$ (D) 0, 21.4

113. A cylist moves in such a way that he takes 60° turn after 100 metres. What is the displacement when he takes seventh turn?

(A) 100 m (B) 200 m

(C) $100\sqrt{3}m$ (D) $100/\sqrt{3}m$

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114. An object is moving in a circle of radius 100 m with a constant speed of 31.4 m/s. What is its average speed for one complete revolution?

(A) zero (B) 31.4 m/s

(C) 3.14 m/s (D) $\sqrt{2} \times 3.14 m/s$

115. A car runs at a constant speed on a circular track of radius 100 m, taking 62.8 s for every circular lap. The average velocity and average speed for each circular respectively are

(A) 0, 0 (B) 0, 10 m/s

(C) 10 m/s, 10 m/s (D) 10 m/s, 0

116. Two boys are standing at the ends A and B of a ground, where AB = a. The boy at B starts running simultaneously with velocity υ and catches the other boy in a time t, where t is

(A) $a/\sqrt{\upsilon^2 + \upsilon_1^2}$ (B) $\sqrt{a/(\upsilon^2 - \upsilon_1^2)}$

(C) $a/(\upsilon - \upsilon_1)$ (D) $a/(\upsilon + \upsilon_1)$

117. The driver of a car moving towards a rocket launching pad with a speed of 6 m/s observes that the rocket is moving with speed of 10 m/s. the upward speed of the rocket as seen by the stationary observer is nearly

(A) 4 m/s (B) 6 m/s

(C) 8 m/s (D) 11 m/s

118. Consider a collection of large number of particles each with speed υ. The direction of velocity is randomly distributed in the collection. The magnitude of the relative velocity between a pair of particles averaged over all the pairs in the collection is

(A) $\frac{4\upsilon}{\pi}$ (B) greater than $\frac{4\upsilon}{\pi}$

(C) less than $\frac{4\upsilon}{\pi}$ (D) zero

119. Two bullets are fired simultaneously, horizontally and with different speed from the same place. Which bullet will hit the ground first?

(A) The faster one

(B) Depends on their mass

(C) The slower one

(D) Both will reach simultaneously

120. Three particles A, B and C are projected from the same point with same initial speeds making angles 30°, 45° and 60° respectively with the horizontal. Which of the following statements is correct?

(A) A, B and C have unequal ranges

(B) Ranges of A and C are equal and less than that of B

(C) Ranges of A and C are equal and greater than that of B

(D) A, B and C have equal ranges.

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