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CLASSROOM CONTACT PROGRAMME

(ACADEMIC SESSION 2023-2024)

Class – XI - IIT – 2023

Test Type: Chapter wise Test **Date: 28/09/2023**

SYLLABUS

PHYSICS

Duration of test 75 min and questions Paper contains 30 questions. The maximum marks are 120.

This Question paper contain Physics which is further divided into two sections.

Section –A contains 20 Questions Section B contains 10 questions. Please ensure that the Questions paper you have received contains ALL THE QUESTIONS in each Part.

In Section A all the 20 Questions are compulsory and in Section B Contain 10 Question, out of these 10 Questions, candidates can choose to attempt any 5 Questions.

Each Question has four choices (a), (b), (c), (d) out of which only one is correct & Carry 4 marks each 1 mark will be deducted for each wrong answer.

If you want to attempt any question then circle should be properly darkened as shown below, otherwise leave blank.

Name of Candidate ……ID. No ……

Candidate's Signature: ……Invigilator's Signature: ……..

PHYSICS

SECTION – A

1. If $\vec{A}\cdot\vec{B}=A\times B$, then angle between A and B is
(a) 45^o (b) 30^o (c) 60^o (d) 90^o

2. The value of λ for which two vectors $\mathbf{a}=5\hat{\mathbf{i}}+\lambda\hat{\mathbf{j}}+\hat{\mathbf{k}}$ and $\mathbf{b}=\hat{\mathbf{i}}-2\hat{\mathbf{j}}+\hat{\mathbf{k}}$ are perpendicular to each other is
(a) 2 (b) -2 (c) 3 (d) -3

3. The distance travelled by a particle starting from rest and moving with an acceleration $\frac{4}{3}ms^{-2}$, in the third second is
(a) $\frac{10}{3}m$ (b) $\frac{19}{3}m$ (c) 6 m (d) 4 m

4. A vehicle travels half the distance l with speed v_1 and the other half with speed v_2, then its average speed is
(a) $\frac{v_1+v_2}{2}$ (b) $\frac{2v_1+v_2}{v_1+v_2}$
(c) $\frac{2v_1v_2}{v_1+v_2}$ (d) $\frac{l(v_1+v_2)}{v_1v_2}$

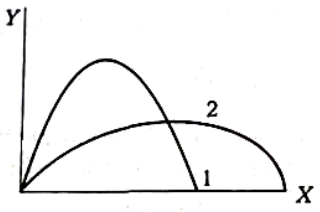
5. A body A starts from rest with an acceleration a_1. After 2 seconds, another body B starts from rest with an acceleration a_2. If they travel equal distance in the 5th second, after the start of A, then the ratio $a_1:a_2$ is equal to
(a) 5 : 9 (b) 5 : 7
(c) 9 : 5 (d) 9 : 7

6. The velocity of a body depends on time according to the equation $v=\frac{t^2}{10}+20$. The body is undergoing
(a) uniform acceleration
(b) uniform retardation
(c) non-uniform acceleration
(d) zero acceleration

7. The coordinates of a moving particle at any time t are given by $x=ct$ and $y=bt^2$. The speed of the particle is given by
(a) $2t\sqrt{b^2-c^2}$ (b) $\sqrt{4b^2t^2+c^2}$
(c) $2t(b+c)$ (d) $2t(b-c)$

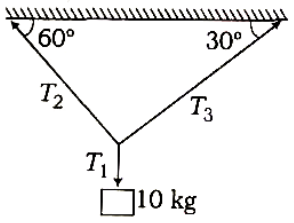
8. The velocity vector of the motion described by the position vector of a particle $r=2t\hat{i}+t^2\hat{j}$ is given by
(a) $v=2\hat{i}+2t\,\hat{j}$ (b) $v=2t\,\hat{i}+2t\,\hat{j}$
(c) $v=t\hat{i}+t^2\hat{j}$ (d) $v=2\hat{i}+t^2\hat{j}$

9. Trajectories of two projectiles are shown in figure, let T_1 and T_2 be the pariods and u_1 and u_2 are their speeds of projections, then



(a) $T_2>T_1$ (b) $T_1=T_2$
(c) $u_1>u_2$ (d) $u_1<u_2$

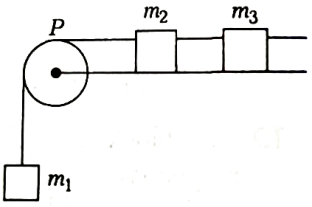
10. A block pof mass 10 kg is suspended by three strings as shown in the figure. The tension T_2 is



(a) 100 N (b) $\frac{100}{\sqrt{3}}N$
(c) $\sqrt{3}\times100\,N$ (d) $50\sqrt{3}\ N$

11. An inclined plane of height h and length l have the angel of inclination θ. The time taken by a body to come from the top to the bottom of this inclined plane will be
(a) $\sin\theta\sqrt{\frac{2h}{g}}$ (b) $\frac{1}{\sin\theta}\sqrt{\frac{2h}{g}}$
(c) $\sqrt{\frac{2h}{g}}$ (d) $\sqrt{\frac{2\,l}{g}}$

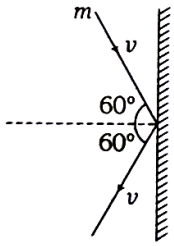
12. A system consist of three masses m_1, m_2 and m_3 connected by a string passing over a pulley P. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (the coefficient of friction = μ). The pulley is frictionless and of negligible mass. The downward acceleration of mass m_1 is (Assume, $m_1 = m_2 = m_3 = m$)



(a) $\frac{g(1-g\mu)}{9}$ (b) $\frac{2g\mu}{3}$

(c) $\frac{g(1-2\mu)}{3}$ (d) $\frac{g(1-2\mu)}{2}$

13. A rigid ball of mass m strikes a rigid wall at 60^o and gests reflected without loss of speed as shown in the figure. The value of impulse imparted by the wall on the ball will be



(a) mv (b) 2 mv (c) mv/2 (d) mv/3

14. A machine gun fires a bullet of mass 40 g with a velocity 1200 ms^{-1}. The man holding it can exert a maximum force of 144 N on the gun. How many bullets can be fired per second at the most?
(a) Only one
(b) Three
(c) Can fire any number of bullets
(d) 144×48

15. Diwali rocket is ejecting 50 g of gases/s at velocity of 400 ms^{-1}. The accelerating force on the rocket will be
(a) 22 dyne (b) 20 N (c) 20 dyne (d) 100 N

16. A rotating wheel changes angular speed from 1800 rpm to 3000 rpm in 20 s. What is the angular acceleration assuming to be uniform ?
(a) $60\pi rad s^{-2}$ (b) $90\pi rad s^{-2}$
(c) $2\pi rad s^{-2}$ (d) $40\pi rad s^{-2}$

17. A car of mass 1000 kg negotiates banked curve of radius 90 m on a frictionless road. If the banking angle is 45^o, the speed of the car is
(a) 20 ms^{-1} (b) 30 ms^{-1} (c) 5 ms^{-1} (d) 10 ms^{-1}

18. The ratio of angular speed of second hand to the hour-hand of a watch is
(a) 3600 : 1 (b) 720 : 1 (c) 72 : 1 (d) 60 : 1

19. Two metal rods of lengths L_1 and L_2 and coefficients of linear expansion α_1 and α_2 respectively are welded together to make a composite rod of length $(L_1 + L_2)$ at 0^oC. Find the effective coefficient of linear expansion of the composite rod.

(a) $\frac{L_1\alpha_1^2 - L_2\alpha_2^2}{L_1^2 + L_2^2}$ (b) $\frac{L_1^2\alpha_1 - L_2^2\alpha_2}{L_1^2 + L_2^2}$

(c) $\frac{L_1\alpha_1 + L_2\alpha_2}{L_1 - L_2}$ (d) $\frac{L_1\alpha_1 + L_2\alpha_2}{L_1 + L_2}$

20. A steel rod of diameter 1 cm is clamped firmly at each end when its temperature at 25^oC, so that it cannot contract on cooling. The tension in the rod at 0^oC is approximately
$(\alpha = 10^{-5}\ /^o C, Y = 2 \times 10^{11} Nm^{-2})$
(a) 4000 N (b) 7000 N
(c) 7400 N (d) 4700 N

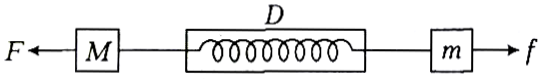
SECTION -B

21. The length of a steel rod is 5 cm longer than that of a brass rod. If this difference in their lengths is to remain same at all temperatures, then find the length of brass rod. (Coefficients of linear expansion for steel and brass are $12 \times 10^{-6}\ /^o C$ and $18 \times 10^{-6}\ /^o C$, respectively. (in cm)

22. A faulty thermometer has its fixed points marked 5^o and 95^o. If the temperature of a body as shown on the Celsius scale is 40^oC, then its temperature shown on this faulty thermometer is

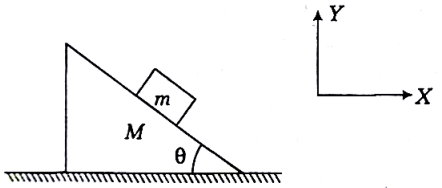
23. A particle moves in a circle of radius 4*m* with a linear velocity of 20 ms^{-1}. Find the angular velocity.

24. A dynamometer D is attached to two bodies of masses M = 6 kg and m = 4kg Forces F = 20 N and f = 10 N are applied to the masses as shown. The dynamometer reads



25. The rear side of a truck is open and a box of mass 20 kg is palced on the truck 4 m away from the open end ($\mu = 0.15$ and g $= 10^{-2}$). The truck starts from rest with an acceleration of 2 ms^{-2} on a straight road. The box will fall off the truck when it is at a distance from the starting point equal to

26. If the elevator in the shown figure is moving upwards with constant acceleration 1 ms^{-2}, the tension in the string connected to block A of mass 6 kg would be (Take, g = 10 ms^{-2})



27. A particle is projected horizontally with a velocity of 4 ms^{-1} from the top of a high tower. The velocity of the body after 0.7 s is nearly (Take g = 10 ms^{-2})

28. Speed of a particle at 3rd and 8th second are 20 ms^{-1} and zero respectively, then average acceleration between 3rd and 8th second will be

29. A body X is projected upwards with a velocity of 98 ms^{-1}, after 4 s, a second body Y is also projected upwards with the same initial velocity. Two bodies will meet after

30. A man is 45 m behind the bus when the bus start accelerating from rest with acceleration 2.5 ms^{-2}. With what minimum velocity should the man start running to catch the bus?