KAMALAMMAL MATRIC. HR. SEC. SCHOOL

Half Portion

Max. Marks : 70 | **XIth Physics** | Time : 2.30 Hrs.

I. Choose the correct answer: **15 x1 = 15**

1. A substance whose mass is 4.27 g occupies 1. 3 cm^3. The number of significant figure in density is _____.

   (a) 1 (b) 2 (c) 3 (d) 4

2. Which of the following physical quantities have same dimensional formula

   (a) Torque and Work done (b) Energy and Angular momentum

   (c) Force and Torque (d) Angular momentum and Linear momentum

3. The maximum value of fractional error in division of two quantities i.e., $x = \frac{A}{B}$ is

   (a) $\frac{\Delta x}{x} = \mp\left(\frac{\Delta A}{A} - \frac{\Delta B}{B}\right)$ (b) $\frac{\Delta x}{x} = \left(-\frac{\Delta A}{A} + \frac{\Delta B}{B}\right)$

   (c) $\frac{\Delta x}{x} = \left(\frac{\Delta A}{A} + \frac{\Delta B}{B}\right)$ (d) $\frac{\Delta x}{x} = \left(\frac{A}{\Delta A} + \frac{B}{\Delta B}\right)$

4. The unit vector in the direction of $\vec{A} = \hat{i} + \hat{j} + \hat{k}$ is

   (a) $\hat{i} + \hat{j} + \hat{k}$ (b) $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{2}}$ (c) $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$ (d) $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{6}}$

5. The position vector of the particle is $\vec{r} = 3t^2\hat{i} + 5t\hat{j} + 9\hat{k}$. What is the acceleration of the particle?

   (a) 6 m s^{-2} along $\hat{t}$ (b) 5 m s^{-2} along $\hat{j}$ (c) 9 m s^{-2} along $\hat{k}$ (d) zero

6. A body is whirled in a horizontal circle of radius vector $\vec{r}$. It has an angular velocity of $\vec{\omega}$. The velocity at any point on circular path is _____.

   (a) v = r ω (b) $v = \frac{\omega}{r}$ (c) $v = \frac{r}{\omega}$ (d) $v = m\frac{\omega}{r}$

7. When a fast moving bus suddenly stops, the passenger is thrown forward because of

   (a) inertia of rest (b) inertia of direction

   (c) moment of inertia (d) inertia of motion

8. In studying motion of a body, the starting of motion is more difficult than maintaining it because, the coefficient of static friction and kinetic friction satisfy the relation ___.

   (a) $\mu_s > \mu_k$ (b) $\mu_s < \mu_k$ (c) $\mu_s = \mu_k$ (d) $\mu_s = ½\ \mu_k$

9. If two masses m_1 and m_2 are experiencing the same force, then the ratio of respective acceleration is _____.

(a) $\frac{a_1}{a_2}=\frac{m_1}{m_2}$ (c) $\frac{a_1}{a_2}=1$ (c) $\frac{a_1}{a_2}=\frac{m_2}{m_1}$ (d) $\frac{a_1}{a_2}=\sqrt{\frac{m_1}{m_2}}$

10. What is the work done by the gravity when an object of mass m is taken from ground to some height h with constant velocity ____.

(a) W = mgh (b) W = −mgh (c) W = 0 (d) W = 2 mgh

11. If the work done is independent of path, then the force is _____.

(a) Non-conservative force (b) conservative force

(c) Newton's force (d) Centrifugal force

12. One horse power is _____.

(a) 707 W (b) 786 W (c) 746 W (d) 647 W

13. Four round objects namely a ring, a disc, a hollow sphere and a solid sphere with same radius R and made of same material start to roll down an inclined plane at the same time. The object that will reach the bottom third is _____.

(a) Solid sphere (b) disc (c) hollow sphere (d) ring

14. The power delivered by the torque is _____.

(a) $P=\vec{\tau}.\vec{\theta}$ (b) $P=\vec{\tau}\times\vec{\theta}$ (c) $P=\tau\theta\sin\theta$ (d) P = 0 (zero always)

15. The center of mass for a uniform rod of mass M and length $\frac{l}{2}$ i.e., 0.5 l lies at the __.

(a) l (b) 0.75 l (c) 0.5 l (d) 0.25 l

II. Answer any six questions: **6 x 2 = 12**

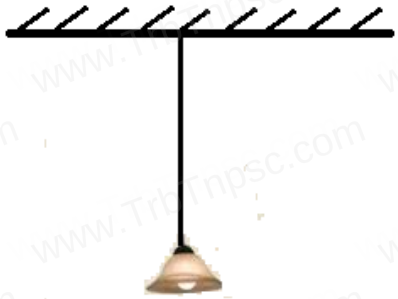
16. Write down the number of significant figures in the following: (i) 0.007 (ii) 400.

17. Write any two limitations of dimensional analysis. Give relevant examples.

18. What is the relation between torque and angular momentum.

19. A particle moves in a circle of radius 10 m. Its linear speed is given by v = 3 t, where t is the time in second and v is in m s^{-1}. Compute the centripetal and tangential acceleration at time t = 2 s.

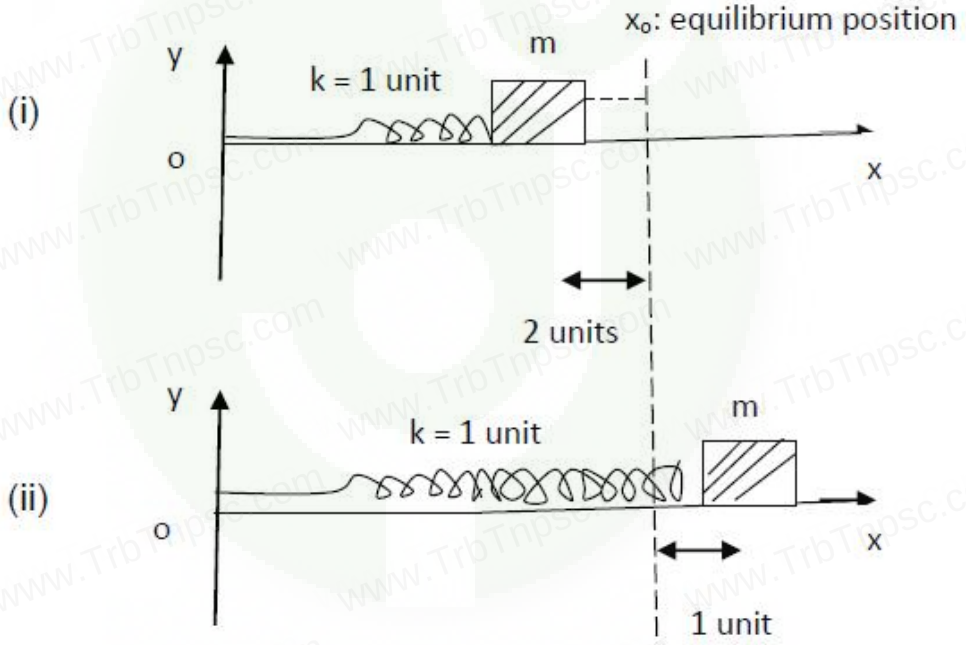
20. Consider a lamp (with holder) of mass 50 g (shown in the figure) Draw free body diagram and compute the tension in the string. (assume lamp with holder as a point mass)



21. What is meant by (i) inertial frame of reference and (ii) non-inertial frame of reference.

22. Define potential energy.

23. Write the spring force acting on the object at the positions given below (surface is frictionless)



24. A force of $\vec{F} = (4\hat{i} - 3\hat{j} + 5\hat{k})$ N is applied at a point whose position vector is $\vec{r} = (7\hat{i} + 4\hat{j} - 2\hat{k})$ m. Find the torque of force about the origin.

III. Answer any six questions: **6 x 3 = 18**

25. Check the correctness of the equation $E = mc^2$ using dimensional analysis method.

26. Two resistances $R_1 = (100 \pm 3)\Omega$ and $R_2 = (150 \pm 2)\Omega$ are connected in series. What is their equivalent resistance?

27. The velocitities of three particles A, B and C are $\vec{V}_A = (3\hat{i} - 5\hat{j} + 2\hat{k})ms^{-1}, \vec{V}_B = (\hat{i} + 2\hat{j} + 3\hat{k})ms^{-1}$ and $\vec{V}_C = (5\hat{i} + 3\hat{j} + 4\hat{k})ms^{-1}$, respectively. Which particle travels at neither greatest nor lowest speed?

28. Derive expression for maximum height, time of flight and range of a projectile.

29. Explain Lami's theorem.

30. Write down any three examples to explain the origin of centripetal force.

31. Derive the expression for gravitational potential energy.

32. Write down the coefficient of restitution for the following cases:

    (i) Perfectly elastic collision

    (ii) Perfect inelastic collision

    (iii) A ball rebounding from a floor

33. Consider a system of two identical particles having mass m. If one of the particles of mass m is pushed towards the center of mass of the particles through a distance x, by what amount the other particle should move so as to keep the center of mass of particles at the original position?

IV. Answer the following questions: **5 x 5 = 25**

34. (a) Obtain an expression for the time period T of a simple pendulum. [The time period T depend upon (i) mass m of the bob, (ii) length l of the pendulum and (iii) acceleration due to gravity g at the place where pendulum is suspended. Assume the constant, k=2π].

(Or)

(b) In a series of successive measurements in an experiment, the readings of the period of oscillation of a simple pendulum were found to be 2.63 s, 2.56 s, 2.42 s, 2.71 s and 2.80 s. Calculate (i) the mean value of the period of oscillation (ii) the absolute error in each measurement (iii) the mean absolute error (iv) the relative error (v) the percentage error. Express the results in proper form.

35. (a) Derive equations of uniformly accelerated motion by calculus method.

(Or)

(b) Discuss uniform circular motion.

36. (a) Explain g variation with Lattitude.

(Or)

(b) A man of 50 kg is standing on the school play ground at Trichy. The latitude of Trichy is 10.8°.

a. Calculate the centrifugal force experienced by the man.

b. With what minimum angular speed the earth must rotate so that the magnitude of gravitational force is equal to the magnitude of centrifugal force that he experiences?

(Radius of the earth is 6400 km and g = 10 m s-2)

c. Calculate the time (in hour) to complete one rotation (one day) of the earth with the new angular speed.

37.(a) Derive velocities after the collision in terms of velocities before collision in elastic collision in one dimension case.

(Or)

(b) State and prove work-kinetic energy theorem.

38.(a) A uniform rod of mass M and length l makes a constant angle θ with an axis of rotation which passes through one end of the rod. Find the moment of inertia about this axis.

(Or)

(b) Discuss the bending of a cyclist in curves.

*** All the Best ***

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