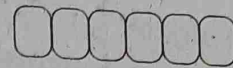


TV11P

Tirunelveli District

Common Quarterly Examination - September 2023



Standard 11

Time Allowed: 3.00 Hours

PHYSICS

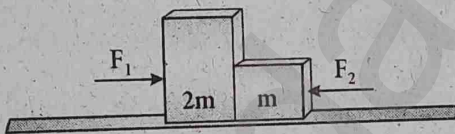
Maximum Marks: 70

PART - I

Note: i) Answer all questions.

ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer. 15×1=15

- 1) If the force is proportional to square of velocity, then the dimension of proportionality constant is
a) $[MLT^0]$ b) $[MLT^{-1}]$ c) $[ML^{-2}T]$ d) $[ML^{-1}T^0]$
- 2) If the length and time period of an oscillating pendulum have errors of 1% and 3% respectively then the error in measurement of acceleration due to gravity is
a) 4% b) 5% c) 6% d) 7%
- 3) If a particle has negative velocity and negative acceleration, its speed
a) increases b) decreases c) remains same d) zero
- 4) An object is dropped in an unknown planet from height 50m, it reaches the ground in 2s. The acceleration due to gravity in this unknown planet is
a) $g = 20 \text{ ms}^{-2}$ b) $g = 25 \text{ ms}^{-2}$ c) $g = 15 \text{ ms}^{-2}$ d) $g = 30 \text{ ms}^{-2}$
- 5) A boy drop a stone by mistake from a building of height 40m, the velocity with which the stone get, when it just reach the ground is
a) 10 ms^{-1} b) 20 ms^{-1} c) 40 ms^{-1} d) 5 ms^{-1}
- 6) Two blocks of masses m and $2m$ are placed on a smooth horizontal surface as shown. In the first case only a force F_1 is applied from the left. Later only a force F_2 is applied from the right. If the force acting at the interface of the two blocks in the two cases is same, then $F_1:F_2$ is



- a) 1:1 b) 1:2 c) 2:1 d) 1:3
- 7) Choose the correct statement from the following
a) Centrifugal and Centripetal forces are action reaction pairs
b) Centripetal forces is a natural force
c) Centrifugal force arises from gravitational force
d) Centripetal force acts towards the centre and Centrifugal force appears to act away from the centre in a circular motion
- 8) Two bodies with same linear momentum moving with kinetic energies in the ratio of 4:1, then their masses in the ratio
a) 4:1 b) 1:1 c) 1:2 d) 1:4
- 9) The work done by the conservative force for a closed path is
a) always negative b) zero
c) always positive d) not defined
- 10) A body of mass $4m$ is lying in xy -plane at rest. It suddenly explodes into three pieces. Two pieces each of mass m move perpendicular to each other with equal speed v . The total kinetic energy generated due to explosion is
a) mv^2 b) $\frac{3}{2}mv^2$ c) $2mv^2$ d) $4mv^2$
- 11) A motor boat moving with a velocity 20 ms^{-1} , experiencing a resistive force of 2000 N by the water, the power of the engine is
a) 1600 W b) 1200 W c) 16000 W d) 13000 W
- 12) A couple produces,
a) pure rotation b) pure translation
c) rotation and translation d) no motion
- 13) The ratio of the acceleration for a solid sphere (mass M and radius R) rolling down an incline of angle θ without slipping and slipping down the incline without rolling is,
a) 5:7 b) 2:3 c) 2:5 d) 7:5

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- 15) Find the first quartile and third quartile for this data
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22

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- 14) According to Kepler's second law, the radial vector to a planet from the sun sweeps out equal areas in equal intervals of time. This law is a consequence of
a) conservation of linear momentum
b) conservation of angular momentum
c) conservation of energy
d) conservation of kinetic energy
- 15) The kinetic energy of the satellite orbiting around the Earth is
a) equal to potential energy
b) less than potential energy
c) greater than potential energy
d) zero

PART - II

Answer ANY SIX questions. Question number 21 is compulsory: $6 \times 2 = 12$

- 16) What are the advantages of the SI system?
17) Define precision with one example.
18) What is the difference between velocity and average velocity?
19) Define one newton.
20) If two objects of masses 2.5 kg and 100 kg experience the same force 5N, what is the acceleration experienced by each of them?
21) Define Coefficient of restitution.
22) State conservation of angular momentum.
23) Two point masses 3 kg and 5 kg are at 4m and 8m from the origin on X-axis. Locate the position of centre of mass of the two point masses from the origin.
24) Define gravitational potential energy.

PART - III

Answer ANY SIX questions. Question number 29 is compulsory: $6 \times 3 = 18$

- 25) Write any three rules for determining significant figures with example.
26) Check the correctness of the equation $\frac{1}{2}mv^2 = mgh$ using dimensional analysis method.
27) 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.
28) Two vectors are given as $\vec{r} = 2\hat{i} + 3\hat{j} + 5\hat{k}$, and $\vec{F} = 3\hat{i} - 2\hat{j} + 4\hat{k}$. Find the resultant vector $\vec{\tau} = \vec{r} \times \vec{F}$.
29) Using free body diagram, show that it is easy to pull an object than to push it.
30) Write the differences between conservative and Non-conservative forces.
31) Two objects of masses 2 kg and 4 kg are moving with the same momentum of 20 kg ms^{-1} . (a) Will they have same kinetic energy? (b) Will they have same speed?
32) Find out the centre of mass for the given geometrical structures.
(a) Equilateral triangle (b) Cylinder (c) Square
33) State Kepler's three laws.

PART - IV

Answer all questions:

- 34) Obtain an expression for the time period T of a simple pendulum. The time period T depends on (i) mass 'm' of the bob (ii) length 'l' of the pendulum and (iii) acceleration due to gravity g at the place where the pendulum is suspended. (Constant $k = 2\pi$) (OR)
Derive an expression for escape speed. $5 \times 5 = 25$
35) State and explain work energy principle. (OR)
Explain in detail the triangle law of addition.
36) Derive the kinematic equations of motion for constant acceleration. (OR)
Derive the expression for moment of inertia of a rod about its centre and perpendicular to the rod.
37) Show that in an inclined plane, angle of friction is equal to angle of repose. (OR)
State and prove parallel axis theorem.
38) Prove the law of conservation of linear momentum. Use it to find the recoil velocity of a gun when a bullet is fired from it. (OR)
What are the application and limitations of the method of Dimensional Analysis?