

11 R

Half Yearly Examination- 2024
PHYSICS

Register No. 240

Marks : 70

Time : 3.00 Hrs.

PART - I

15 x 1 = 15

Choose the correct answer

- A round object of mass M and radius R rolls down without slipping along an inclined plane. The frictional force.
 - dissipates kinetic energy as heat
 - decreases the rotational motion
 - decreases the rotational and translational motions
 - converts translational energy into rotational energy.
- Which of the following physical quantities cannot be represented by a scalar?
 - mass
 - length
 - momentum
 - magnitude of acceleration.
- Force acting on the particle moving with constant speed is.....
 - always zero
 - need not be zero
 - always non zero
 - cannot be concluded
- The dimensional formula of Planck's constant
 - $[ML^2T^{-1}]$
 - $[ML^2T^{-3}]$
 - $[MLT^{-1}]$
 - $[ML^3T^{-3}]$
- Two bodies of masses m and $4m$ are moving with equal kinetic energies. The ratio of their linear moment is.....
 - 1 : 2
 - 1 : 4
 - 4 : 1
 - 1 : 1
- The value of Wien's constant.....
 - $2.89 \times 10^3 \text{ mk}$
 - $2.89 \times 10^{-3} \text{ mk}$
 - $2.98 \times 10^{-3} \text{ mk}$
 - $2.98 \times 10^3 \text{ mk}$
- If the linear momentum of the object is increases by 0.1%, then kinetic energy is increased by.....
 - 0.1%
 - 0.2%
 - 0.4%
 - 0.01%
- When a uniform rod is heated, which of the following quantity of the rod will increase
 - mass
 - weight
 - center of mass
 - moment of inertia
- If a wire is stretched to double of its original length, then the strain in the wire is.....
 - 1
 - 2
 - 3
 - 4
- If the temperature and pressure of a gas is doubled the mean free path of the gas molecules
 - remains same
 - doubled
 - tripled
 - quadrapoled
- The damping force on an oscillator is directly proportional to the velocity. The units of the constant of proportionality are.....
 - kg ms^{-1}
 - kg ms^{-2}
 - kg s^{-1}
 - kgs
- If the mass and radius of the earth are both doubled, then the acceleration due to gravity 'g'
 - remains same
 - $\frac{g}{2}$
 - $2g$
 - $4g$
- The expression for centripetal acceleration
 - $a = -wr^2$
 - $a = -w^2r$
 - $a = \frac{-r^2}{v}$
 - $a = \frac{-v}{r^2}$
- The speed of a solid sphere after rolling down from rest without sliding on an inclined plane of vertical height h is.....
 - $\sqrt{\frac{4}{3}gh}$
 - $\sqrt{\frac{10}{7}gh}$
 - $\sqrt{2gh}$
 - $\sqrt{\frac{1}{2}gh}$
- Momentum is closely related to
 - force
 - impulse
 - kinetic energy
 - acceleration

PART - II

Note : Answer any six questions. Question No.24 is compulsory.

6 x 2 = 12

- Define one radian.

17. Under what condition will a car skid on a leveled circular road?
18. Calculate the energy consumed in electrical units when a 75W fan is used for 8 hours daily for one month (30 days).
19. State conservation of angular momentum.
20. Why is there no lunar eclipse and solar eclipse every month?
21. Define Poisson's ratio.
22. What is meant by state variable? Give an example?
23. Why moon has no atmosphere?
24. Check the correctness of the equation $\frac{1}{2} mv^2 = mgh$ using dimensional analysis method.

PART - III

Note : Answer any six question. Question No.33 is compulsory.

6 x 3 = 18

25. Discuss the properties of scalar product.
26. Explain the similarities and differences of centripetal and centrifugal forces.
27. Arrive at an expression for power and velocity. Give some examples for that.
28. What are geo stationary and polar satellite?
29. Explain the different types of modulus of elasticity.
30. Explain in detail the thermal expansion.
31. Describe the total degrees of freedom for monoatomic molecule, diatomic molecule, and triatomic molecule.
32. State laws of simple pendulum.
33. A force of $(4\hat{i} - 3\hat{j} + 5\hat{k})\text{N}$ is applied at a point whose position vector is $(7\hat{i} + 4\hat{j} - 2\hat{k})\text{M}$. Find the torque of force about the origin.

PART - IV

Answer all the questions.

5 x 5 = 25

34. a) Explain in detail the triangle law of addition.
(OR)
b) Explain the types of equilibrium with suitable examples.
35. a) Assuming that the frequency γ of a vibrating string may depend upon
(i) applied force (F), (ii) length (ℓ) (iii) mass per unit length (m), prove that $\gamma \propto \frac{1}{\ell} \sqrt{\frac{F}{m}}$ using dimensional analysis.
(OR)
b) Explain the motion of blocks connected by a string in horizontal motion.
36. a) Explain with graphs the difference between work done by a constant force and by a variable force.
(OR)
b) Derive an expression for the elastic energy stored per unit volume of a wire.
37. a) Derive an expression for energy of satellite.
(OR)
b) Discuss various modes of heat transfer.
38. a) Write down the postulates of kinetic energy of gases.
(OR)
b) Write down the differences between simple harmonic motion and angular simple harmonic motion.