

**HALF YEARLY EXAMINATION -2024****CLASS: 11****PHYSICS**

Reg.No

Time : 3.00 Hours

MARKS : 70

**PART - I****15 × 1 = 15**

Note:

(i) Answer all the questions

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer

- If the masses of the Earth and Sun suddenly double, the gravitational force between them will  
a) remain the same    b) increase 2 times    c) increase 4 times    d) decrease 2 times
- Which of the following pairs of physical quantities does not have same dimensional formula?  
a) Work and torque    b) Angular momentum and Planck's constant  
c) Tension and surface tension    d) Impulse and linear momentum
- A sound wave whose frequency is 5000 Hz travels in air and then hits the water surface. The ratio of its wavelengths in water and air is  
a) 4.30    b) 0.23    c) 5.30    d) 1.23
- Surface tension of water becomes zero at  
a) 0°C    b) 437°C    c) 100°C    d) 374°C
- Which one of the following physical quantities cannot be represented by a scalar?  
a) Mass    b) Length    c) Momentum    d) Magnitude of acceleration
- A hollow sphere is filled with water. It is hung by a long thread. As the water flows out of a hole at the bottom, the period of oscillation will  
a) first increase and then decrease    b) first decrease and then increase  
c) increase continuously    d) decrease continuously
- The ratio of the distance travelled in successive equal intervals of time by a body falling from rest are  
a) 1:3:5:7:9    b) 2:4:6:8:10    c) 1:4:7:10:13    d) 1:4:9:16:25
- If the temperature and pressure of a gas is doubled the mean free path of the gas molecules  
a) remains same    b) doubled    c) tripled    d) quadrupled
- The kinetic energy of a body of mass 4 kg and momentum 6 N s will be  
a) 4.5 J    b) 2.5 J    c) 5.5 J    d) 3.5 J
- What is the minimum velocity with which a body of mass  $m$  must enter a vertical loop of radius  $R$  so that it can complete the loop?  
a)  $\sqrt{2gR}$     b)  $\sqrt{3gR}$     c)  $\sqrt{5gR}$     d)  $\sqrt{gR}$
- When a uniform rod is heated, which of the following quantity of the rod will increase  
a) mass    b) weight    c) center of mass    d) moment of inertia
- The phase difference between displacement and acceleration of a particle in a simple harmonic motion is  
a)  $\frac{3\pi}{2}$     b)  $\frac{\pi}{2}$     c) zero    d)  $\pi$
- Force acting on the particle moving with constant speed is  
a) always zero    b) need not be zero  
c) always non zero    d) cannot be concluded
- Two stars A and B radiate maximum energy at the wavelength of 360 nm and 480 nm respectively. The ratio of the surface temperature of A and B is  
a) 3:4    b) 81:256    c) 4:3    d) 256:81
- The center of mass of a system of particles does not depend upon,  
a) position of particles    b) relative distance between particles  
c) masses of particles    d) force acting on particle

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## PART - II

6 × 2 = 12

**Answer any six questions. Question no. 18 is compulsory:**

16. State Newton's first law.
17. Define torque.
18. Suppose an object is thrown with initial speed  $10 \text{ m s}^{-1}$  at an angle  $\pi/4$  with the horizontal, what is the range covered?
19. What is Reynolds number? Give its significance.
20. Why is the energy of a satellite negative?
21. What are conservative forces?
22. 500 g of water is heated from  $30^\circ\text{C}$  to  $60^\circ\text{C}$ . Ignoring the slight expansion of water, calculate the change in internal energy of the water? (specific heat of water  $4184 \text{ J kg}^{-1} \text{ K}^{-1}$ )
23. Write the expression for *rms* speed, average speed, and most probable speed of a gas molecule.
24. What is meant by maintained oscillation? Give an example.

## PART - III

6 × 3 = 18

**Answer any six questions. Question no. 30 is compulsory:**

25. List the rules for determining significant figures.
26. What are the various types of friction? Suggest a few methods to reduce friction.
27. 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.
28. Write the characteristics of stationary waves.
29. Draw PV diagram for (i) isothermal process (ii) isobaric process.
30. Water rises in a capillary tube to a height of 2.0 cm. How much will the water rise through another capillary tube whose radius is one-third of the first tube?
31. State Kepler's three laws.
32. Derive the expression for centripetal acceleration.
33. Compare elastic collision and inelastic collision.

## PART - IV

5 × 5 = 25

**Answer all the questions:**

34. a) Explain variation of  $g$  with altitude.  
(or)  
b) Derive the ratio of molar specific heat capacities of mono atomic, diatomic and triatomic molecules.
35. a) Assuming that the frequency  $\gamma$  of a vibrating string may depend upon i) applied force ( $F$ ) ii) length ( $l$ ) iii) mass per unit length ( $m$ ), prove that  $\gamma \propto \frac{1}{l} \sqrt{\frac{F}{m}}$  using dimensional analysis.  
(or)  
b) Derive the expression for terminal velocity of a sphere moving in a high viscous fluid using Stoke's formula
36. a) State and prove perpendicular axes theorem.  
(or)  
b) How will you determine the velocity of sound using resonance air column apparatus?
37. a) Explain the heat engine and obtain its efficiency.  
(or)  
b) Explain in detail the triangle law of vector addition.
38. a) Discuss the energy in simple harmonic motion.  
(or)  
b) Explain the motion of blocks connected by a string in horizontal motion.

