25401

PHYSICS

(New/Old Design)

Time : 3 Hours] **[Maximum Marks : 70**

NOTE :— The questions in the question paper are based on **Two Patterns** marked as "**New Design**" and "**Old Design**".

"NEW DESIGN (This is based on CBSE Pattern)" and **"OLD DESIGN (This is based on Previous Pattern)"** respectively and candidates are advised to appear in the relevant design meant for them. Candidates who may attempt the questions partly from **"New Design"** and partly from **"Old Design"** will not be awarded. Candidates are also advised to record **"New Design"** or **"Old Design"** as the case may be, on the front page of the answer-book.

(New Design)

(Very Short Answer Type Questions) 1 each

1. If $y = 3x^2 + 4x + 5$, find $\frac{dy}{dx}$, at $x = 1$.

2. Why are wheels made circular ?

3. Define free vibrations.

4. A pendulum is taken to moon. Will it go faster or slower in comparison to earth ?

5. Can temperature of a gas be increased by keeping its pressure and volume constant.

(Very Short Answer Type Questions) 2 each

6. If $x = a + bt + ct^2$, where (x) is in metre and (t) in second, find units of a, b and c.

Or

The length and breadth of a rectangular object are 25.2 cm and 16.8 cm respectively and have been measured to an accuracy of 0.1 cm. Find the percentage error in the area of block.

7. Find the work done by a force $\vec{F} = 3\hat{i} + 4\hat{j} + 5\hat{k}$ in displacing a body through a distance of $\vec{S} = 2\hat{i} - 3\hat{j} + 4\hat{k}$.

8. What is reversible and irreversible process ?

9. Define streamline and turbulent flow.

10. The moment of inertia of a sphere about its diameter is $\frac{2}{5}MR^2$. What is its radius of gyration about that axis ?

(Short Answer Type Questions) 3 each

11. Show that Newton's second law is the only real law of motion.

12. Differentiate e^{ax} by *ab*-initio method.

13. Derive expression for viscous force acting on a body of radius (r) falling with a velocity (v) through a viscous liquid, on the basis of dimensional analysis.

14. Define impulse and momentum. Write the relation between them.

15. A stone of mass 6 kg falls from rest at a place where $g = 9.8\ m/s^2$. What is its K.E. at the end of 5th seconds.

16. Define work, power and energy. Give their S.I. units.

17. Write six postulates of kinetic theory of gases.

18. State law of equipartition of energy. Also define degree of freedom.

19. What is a simple pendulum ? Derive expression for time period of simple pendulum.

20. State Kepler's three laws of planetary motion.

21. At what height, acceleration due to gravity is $\frac{3}{4}$th of that at surface of earth ?

22. A Carnot's engine takes in 1000 k calories of heat from a reserviour at 627°C and exhausts it to a sink at 27°C. What is its efficiency ?

(Value Based Questions) 4

23. Calculate the K.E. of rotation of a circular disc of mass 1 kg, and radius 0.2 m rotating about an axis passing through the centre and perpendicular to its plane. The disc makes $\frac{30}{\pi}$ rotations per minute.

(Long Answer Type Questions) 5 each

24. What do you mean by scalar and vector product of vectors ? Give their four properties and two examples.

Or

Derive :

(i) $v = u + at$

(ii) $s = ut + \frac{1}{2}at^2$

where letters have their usual meanings.

25. Derive an expression for the total energy of a body executing SHM. Show that total energy is independent of displacement of body from mean position.

Or

Derive expression for the displacement of a plane progressive wave.

26. State Bernoulli's theorem in different form. Briefly explain its one application.

Or

Name the three modes of transfer of heat. Explain them.

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XILKGRPO/N19

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1. Derive :

(i) $v = u + at$

(ii) $s = ut + \frac{1}{2}at^2$

using graphical method, where letters have their usual meanings.

Or

Find an expression for maximum height, horizontal range and time of flight for an oblique projectile fired at an angle with the horizontal.

2. Define friction and angle of repose. Find an expression for the coefficient of friction in terms of tangent of angle of repose.

Or

State Newton's laws of motion. Show that Newton's second law is the only real law of motion.

3. State Stokes' law of viscous force. Derive an expression for viscous force acting on a sphere falling through a viscous liquid, on the basis of dimensionless.

Or

What are three modes of transfer of heat ? Briefly discuss them.

4. Derive an expression for the total energy of a body executing S.H.M. Show that total energy in S.H.M. is conserved.

Or

What is a plane progressive wave ? Derive an expression for the a plane harmonic progressive wave.

(Short Answer Type Questions) 3 each.

5. Differentiate 'log x' by *ab*-initio method.

6. If force (F), velocity (v) and time (T) are chosen as fundamental units, then what is the dimensional formula for mass ?

7. Define potential energy. Derive P.E. of an elastic stretched spring.

8. Derive relation between torque and moment of inertia.

9. State and explain Newton's law of gravitation.

10. State and explain first law of thermodynamics.

11. State law of equipartition of energy and define degree of freedom.

12. The acceleration due to gravity on the surface of moon is 1.7 m/s^2. What is the time period of a simple pendulum on the surface of moon, if its time period on the surface of earth is 3.5 seconds. Take value of g = 9.8 m/s^2.

(Very Short Answer Type Questions) 2 each

13. The volume of a liquid flowing out per second of a pipe of length (l) and radius (r) is written as $V = \frac{\pi}{8}\frac{Pr^4}{\eta l}$, where P is pressure difference between the two ends of pipe and η is coefficient of viscosity of the liquid. Check the correct of the above equation on the basis of dimensions.

14. A particle moves in a straight line, whose displacement after time (t) is $x = t^2 + 2t + 5$. Find speed of particle after 5 seconds.

15. Define Energy. Give its S.I. units.

16. How does earth retain its atmosphere ?

17. Define gravitational potential energy and gravitational potential.

18. Define stress. Give its S.I. unit.

19. What is isothermal and isochoric process ?

20. Define degrees of freedom of a molecule. Write formula for finding degrees of freedom of a molecule.

(Objective Type Questions) 1 each

21. Do as directed :

(i) Solve $\int_0^{\pi} \sin x.dx$.

= (-Cosx)0 to pie
= - { cos pie - cos 0 } = - { -1 -1 }
= - { -2 } = 2

(ii) Aeroplanes, jets etc. are streamlined to reduce fluid friction.

(True/False)

(iii) Newton's second law gives the measure of :

(A) Force (B) Energy

(C) Momentum (D) Acceleration

(iv) The momentum of a body is P and its kinetic energy is E. If momentum becomes 2P, its K.E. will be :

(A) $\frac{E}{2}$ (B) E

(C) 2E (D) 4E

(v) **What is conservative force ?**

(vi) If no force is exerted on a system, then velocity of centre of mass is :

(A) Constant (B) Increasing

(C) Decreasing (D) Zero

(vii) The no. of degrees of freedom for a diatomic gas molecule is :

(A) 2 (B) 3

(C) 5 (D) 6

(viii) Boyle's law is an example of isothermal process. (True/False)

(ix) What type of waves are produced in a sitar wire ?

(A) Stationary transverse wave

(B) Stationary longitudinal wave

(C) Progressive transverse wave

(D) Progressive longitudinal wave

(x) The change in frequency due to Doppler's effect does not depend upon the distance between the source and observer. (True/False)