BUDHA DAL PUBLIC SCHOOL, PATIALA
Final Examination (19 February 2026)
Class XI (Science)
Subject – Physics (Set - B)

M.M. 70

Time: 3hrs

General Instructions:

(1) There are 33 questions in all. All questions are compulsory.
(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E
(3) All the sections are compulsory.
(4) **Section A** contains 16 questions, 12 MCQ and 4 Assertion Reasoning based of 1 mark each, **Section B** contains 5 questions of two marks each, **Section C** contains 7 questions of three marks each, **Section D** contains two case study based questions of four marks each **and Section E** contains three long answer questions of five marks each.
(5) Use of calculators is not allowed.

Section - A

Q1. If $\vec{A} = 2\hat{\imath} - 3\hat{\jmath} + \hat{k}$ *and* $\vec{B} = 3\hat{\imath} + 4\hat{\jmath} + n\hat{k}$ are perpendicular to each other. The positive value of n is

a) 2 b) 4 c) 6 d) 7

Q2. When the velocity is doubled, the banking angle should be

a) 1/2 b) 1/4 c) 4 times d) 8 times

Q3. A body has uniform circular motion. Which of the quantity of the body will remain the same?

a) velocity b) momentum c) kinetic energy d) both velocity and momentum

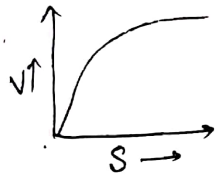
Q4. If there is no external torque acting on system of particles, which of the following will be constant?

a) Linear momentum b) Angular momentum c) Force d) Impulse

Q5. Planck's constant has the dimensions of

a) Energy b) Angular momentum c) Power d) Momentum

Q6. A lead shot of 1mm diameter falls through a long column of glycerine. The variation of its velocity with distance (S) is represented by

(a)


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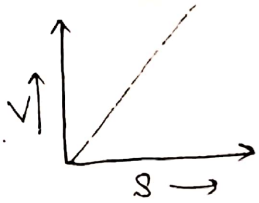

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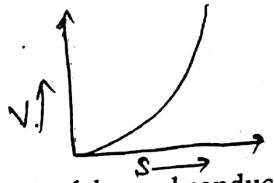

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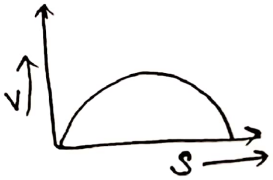

Q7. The unit of thermal conductivity is

a) $W\ m^{-1}\ K^{-1}$ b) $J\ K^{-1}$ c) $Wm\ K$ d) $J\ K$

Q8. The length of the pendulum of the clock, is decreased, it will

a) go fast b) go slow c) neither go slow or fast d) none of these

Q9. Neglecting the density of air, the terminal velocity obtained by a raid drop of radius 0.3 mm falling through air of viscosity 1.8×10^{-5} Ns m^{-2} will be

a) $10.9\ m\ s^{-1}$ b) $7.48\ m\ s^{-1}$ c) $3.7\ m\ s^{-1}$ d) $12.8\ m\ s^{-1}$

Q10. A satellite in a circular orbit of radius R has a period of 4 hours. Another satellite with orbital radius 3 R around the same planet will have a period (in hours)

a) $4\sqrt{27}$ b) $4:\sqrt{8}$ c) 4 d) 16

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Q11. The coefficient of restitution e for a perfectly elastic collision is
a) 1 b) 0 c) ∞ d) -1

Q12. Equation of a plane progressive wave is given by $y = 0.6 \sin 2\pi \left(t - \frac{x}{2}\right)$. On reflection from a denser medium its amplitude becomes 2/3 of the amplitude of the incident wave. The equation of the reflected wave is

a) $y = 0.6 \sin 2\pi \left(t + \frac{x}{2}\right)$ b) $y = 0.4 \sin 2\pi \left(t + \frac{x}{2}\right)$

c) $y = -0.4 \sin 2\pi \left(t + \frac{x}{2}\right)$ d) $y = -0.4 \sin 2\pi \left(t - \frac{x}{2}\right)$

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

a) **Both Assertion (A) and Reason (R) true and Reason (R) is the correct explanation of Assertion (A).**
b) **Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).**
c) **Assertion (A) is true but Reason (R) is false.**
d) **Assertion (A) is false and Reason (R) is also false.**

Q13. Assertion (A) : If ice caps of pole melt, the body provides the torque to roll the body on inclined plane.

Reason (R) : When water flows towards the equator, moment of inertia of the earth decreases and hence increases the frequency of the rotation of the earth.

Q14. **Assertion (A) : Water drops take spherical shape when failing freely.**

Reason (R) : Water has minimum surface tension among all liquids.

Q15. **Assertion (A) : In an adiabatic process, change in internal energy of a gas is equal to work done on/ by the gas in the process.**

Reason (R) : This is because temperature of the gas remains constant in an adiabatic process.

Q16. **Assertion (A) :** Two simple harmonic motions of angular frequencies 100 rad s^{-1} and 1000 rad s^{-1} have same displacement amplitude. The ratio of their maximum acceleration is 1 : 100.

Reason (R) : Acceleration is SHM, $a = -\omega^2 x$

Section - B

Q17. In a car lift compressed air exerts a force F_1 on a small piston having a radius of 5cm. This pressure is transmitted to a second piston of radius 15cm. If the mass of the car to be lifted to 1350 kg, calculate F_1. What is the pressure necessary to accomplish this task? ($g = 9.8\ m/s^2$)

OR

Derive an expression for the terminal velocity of a sphere falting through a viscous fluid.

Q18. **Define orbital velocity of a satellite. Obtain an expression for the orbital velocity of a satellite and time period of a satellite orbitary at a height h above the surface of earth.**

Q19. If R be the horizontal range for v inclination and H be the maximum height reached by the projectile, show that maximum range is given by $\frac{R^2}{8H} + 2H$

Q20. Show that the elastic potential energy stored per unit volume of a stretched wire is equal to

$\frac{1}{2} \times$ stress $\times$ strain.

Q21. Prove that $C_P - C_V = R$

Section - C

Q22. a) **Why two spheres of same mass and same radius, one solid and other hollow have unequal moment of inertia.**

b) **Derive an expression which gives the relationship between angular momentum and moment of inertia.**

A body of mass M at rest is struck by a body of mass m. show that the fraction of K.E. of mass m transferred to the struck particle is $\frac{4Mm}{(m+M)^2}$

Q24. a) Obtain an expression for the angle made by a cyclist with the vertical to negotiate a curved road safely.

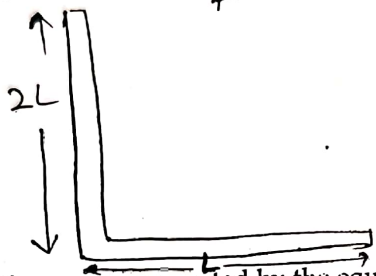
b) Is large brakes on a bicycle wheel more effective than small one? Explain.

Q25. a) Discuss the lift of an air foil on the basis of Bernoulli's principle.

b) Define pressure head and velocity head.

Q26. At what height from the surface of earth will the value of 'g' be reduced by 40% from the value at the earth surface? Radius of earth 6400 km.

Q27. A uniform thin rod of length 2L is bent at right angles at a distance from one end as shown in figure. If length of rod is 1.8m, find the coordinates of position vector of the centre of mass of the system.



Q28. Two simple Harmonic motions are represented by the equations.

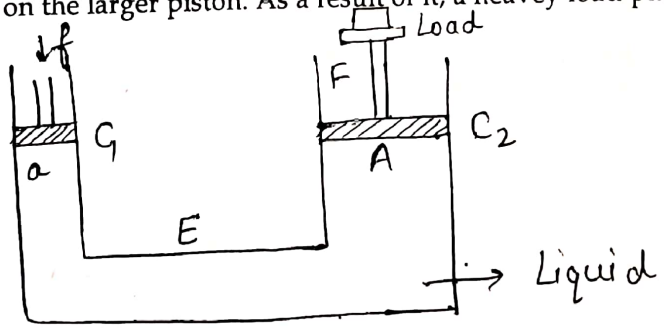
$y_1 = 10 \sin\frac{\pi}{4}(12t + 1)$ & $y_2 = 5(\sin 3\pi t + \sqrt{3}\cos 3\pi t)$

Find the ratio of their amplitudes. What are the time periods of the motions?

Section - D

Q29. **Read the following paragraph and answer the questions that follow.**

Hydraulic lift is an application of Pascal's law. It is used to lift heavy loads. It is a force multiplier. So, when small forces applied on the smaller piston (acting downward) will be appearing as a very large force (acting upward) on the larger piston. As a result of it, a heavey load placed on the larger piston is easily lifted upwards.



(i) Pascal's law states that pressure in a fluid at rest is the same at all point. If

a) they are at the same height
b) they are along same plane
c) they are along same line
d) both (a) and (b)

(ii) Pressure is applied to an enclosed fluid as shown in the above figure. It is

a) increased and applied to every part of the fluid
b) diminished and transmitted to the walls of the container
c) increased in proportion to the mass of the fluid and then transmitted
d) . transmitted unchanged to every portion of the fluid and

(iii) Pressure at a point inside liquid does not depend on

(a) the depth of the point below the surface of the liquid
(b) the nature of the liquid
(c) the acceleration due to gravity at that point
(d) total weight to fluid in the beaker

(iv) If work done by piston in the given figure on fluid W1, then work done by fluid in limbs on piston P_2 is

a) $\frac{W_1}{4}$ b) $4W_1$ c) $\frac{W_1}{2}$ d) W_1

Q29. Read the following paragraph and answer the questions that follow.

A gas is a collection of large number of molecules. These molecules are perfectly elastic, identical and hard spheres. The pressure exerted by an ideal gas is given by $P = \frac{1}{3}pC^2 = \frac{1}{3}\frac{M}{V}C^2$

Using standard gas equation PV = RT, we find that $C^2 = \frac{3RT}{M}$ or $C \propto \sqrt{T}$ or $\frac{1}{2}mC^2 \propto T$, where $\frac{1}{2}C^2$ is average translation kinetic energy per molecule of gas

(i) At 0 K what happens?

a) efficiency or engines becomes infinite
b) all liquids freezes
c) molecular motion ceases
d) none of these

(ii) At 27° C temperature, the kinetic energy of an ideal gas is E_1. If the temperature of gas is increased to 327° C then kinetic energy will be

(a) $E_1/\sqrt{2}$ (b) $\sqrt{2}\,E_1$ c) $2E_1$ d) $\frac{E_1}{2}$

(iii) The average kinetic energy of a gas molecule is

(e) Proportional to pressure of gas
(f) Inversely proportional to the volume of gas
(g) Inversely proportional to absolute temperature of gas
(h) Proportional to absolute temperature of gas

(iv) The molecule of an ideal gas at 27°C have a certain mean velocity. At what approximate temperature, will the mean velocity be doubled

b) 1200°C b) 927°C c) 327°C d) 54°C

OR

(iv) In the kinetic theory of gases, it is assumed that the molecules

a) repel each other b) collide elastically
c) are massless particles d) move with uniform speed

Q31. Derive Newton's formula for speed of sound in ideal gases. What is Laplace correction? Deduce the formula using Laplace correction.

OR

What are stationary waves? Why are they so called? Obtain an expression for the stationary wave formed in a string fixed at both the ends, hence obtain the position of nodes and antinodes.

Q32. a) Define gravitational potential energy. Derive an expression for the gravitational potential energy of a body at distance r from the centre of earth.

b) A light string passing over a smooth light frulley connects two blocks of masses m_1 and m_2 (vertically). Calculate the ratio of the masses if the acceleration of the system is g/8.

OR

a) Describe various modes of vibration in an open ends organ pipe.

b) Show that the ratio of frequencies of different harmonize with the first harmonic in open pipe is 1 : 2 : 3.

c) In an open organ pipe, the fundamental frequency is 30Hz. If the organ pipe is closed at one and then what will be the fundamental frequency?

Explain why

a) The size of the needle of a syringe controls flow rate better than the thumb pressure exerted by a doctor, while administering an injection.

b) The blood pressure in human is greater at the feet than the brain.

c) The angle of contact of mercury with glass is acute.

d) Consider a drop of rain having radius 0.4 mm and terminal velocity 2 m/s. Find the viscous force on the rain drops, if viscosity of air is 18×10^{-5} dyne cm^{-2} sec.

OR

a) Find the apparent weight of a person standing on a weighing machine placed in a lift, when lift is

(i) moving upward or downward with constant velocity.

(ii) moving upward with an acceleration 'a'.

b) Show that Newton's second law is the real law of motion.

c) Rain appears to fall vertically downward with a speed of 4km/hr for a person moving eastward with a speed of 3km/hr. Calculate the actual speed and direction of the rain.