

General Instruction:

1. This paper contains 26 questions. All the questions are compulsory.
2. Question No. 1 to 5 are very short type questions and carry one mark each.
3. Question No. 6 to 10 carry two marks each.
4. Question No. 11 to 22 carry three marks each.
5. Question No. 23 is value based question and carry four marks.
6. Question No. 24 to 26 carry five marks each.
7. There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions in five marks each. You have to attempt only one of the choices in such question.
8. Use of calculator is not permitted

- 1) Define precision
- 2) If percentage error in radius is .3 % then what will the percentage error in its volume?
- 3) What does the speedometer of car indicate?
- 4) What is the angle between velocity vector and acceleration vector in uniform circular motion?
- 5) What is the ratio of the SI to the CGS units of momentum?
- 6) State Impulse-momentum theorem.
- 7) A lady walking towards east on a road with velocity of 10m/s encounters rain falling vertically with a velocity of 30m/s. At what angle she should hold her umbrella to protect herself from the rain?
OR
Determine value of λ such that $\vec{A} = 2\hat{i} + \lambda\hat{j} + \hat{k}$; $\vec{B} = 4\hat{i} - 2\hat{j} - 2\hat{k}$ are perpendicular to each other.
- 8) The distance travelled by a body is found to be directly proportional to the square of time. Is the body moving with uniform velocity or with uniform acceleration?
- 9) If power $P = \frac{b-x^2}{at}$ where x is distance and t is time then find dimensional of a and b.
- 10) Write the uses of the dimensional analysis.
- 11) Write down the dimensional formulae of following
a) Gravitational constant b) Torque c) Moment of Inertia d) Angular momentum
e) Power f) Planck's constant g) Specific heat h) Impulse
- 12) If the sides of rectangle are $20 \pm 0.2\text{cm}$ and $30 \pm .01\text{cm}$, calculate the percentage error in its area and perimeter.
- 13) A large fluid star oscillates in space under the influence of its own gravitational field. Using dimensional analysis find the expression for its time period (T) of oscillation in terms of radius(R) mean density of fluid (ρ) and universal gravitational constant (G).

- 14) On a two lane road, car A is travelling with a speed of 35 km/h. Two cars B and C approach car A in opposite directions with a speed of 54km/h each. At a certain instant, when distance AB is equal to AC, both being 1Km , B decides to overtake A before C does. What minimum acceleration of car B is required to avoid an accident?
- 15) A Police van moving on a highway with a speed of 30 km/h fires a bullet at a thief's car speeding away in the same accelerated with a speed of 192 km/hr. If the muzzle speed of the bullet is 150 m/s with what speed does the bullet hit the thief's car?
- 16) The speed of a train increases at a constant rate α from zero to v , and then remains constant for an interval, and finally decreases to zero at a constant rate β . If L be the total distance described, prove that the total time taken is

$$(L/v) + (v/2) (1/\alpha + 1/\beta)$$
- 17) From the top of a building 19.6m high, a ball is projected horizontally. After how long does it strike the ground? If the line joining the point of projection to the point of projection to the point where it hits the ground makes an angle of 45° with the horizontal, what is the initial velocity of the ball?
- 18) A man capable of swimming with a velocity u in still water, wants to cross a river of width 'd' flowing with a velocity v . Find the angle in which he should be directed to reach at the exactly opposite point? To cross by the shortest time, in which direction, he should swim? What is the value of shortest time?
- 19) State parallelogram law of vector addition. Show that resultant of two vectors A and B inclined at an angle θ is $R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$.
- 20) A person of mass m is standing in a lift. Find his apparent weight when the lift is :
 (a) Moving upward with uniform acceleration a .
 (b) Moving downward with uniform acceleration a ($<g$).
 (c) Falls freely.
- 21) Prove that the coefficient of static friction is tangent of the angle of repose.
- 22) Two masses m_1 and m_2 are connected at the two ends of a light inextensible string that goes over a frictionless pulley. Find the acceleration of the masses and the tension in the string when the masses are released. If $m_1 = 8\text{kg}$ and $m_2 = 12\text{kg}$. Find acceleration and tension in the string by using above derived formulae.
- 23) Rohit was sitting outside his house when he saw that the overhead tank of his house was overflowing. He went upstairs and tried to close the tap. He closed it as tightly as he could but it was still leaking drop by drop. Then he thought of an idea and put a bucket under it as he had studied in school that water is precious and we should save it. Then he went to call the plumber to get it repaired.
 (a) What qualities of Rohit do you appreciate?
 (b) If water drops fall at regular intervals from a tap which is 5m above the ground, the third drop is leaving the tap at the instant the first drop touches the ground. How far above the ground is the second drop at that instant.
- 24) Consider a mass m attached to a string of length l performing vertical circle. Find an expression for the
 (a) Velocity at any point,
 (b) Tension at any point,

(c) Velocity minimum at the lower-most point for a vertical circle.

OR

Explain:

(a) Why are ball bearings used in machinery?

(b) Why does a horse have to apply more force to start a cart than to keep it moving?

(c) What is the need for banking the tracks?

(d) State two advantages and two disadvantages of friction.

25) Prove the following:

(a) For the two angles of projection θ and $(90 - \theta)$ with the same velocity v ,

(i) Range is same

(ii) Heights are in the ratio $\tan^2 \theta : 1$

(b) If the range and maximum height are equal, the angle of projection is $\tan^{-1}(4)$

OR

A projectile shot at an angle of 60° above the horizontal ground strikes a vertical wall 30m away at a point 15m above the ground. Find the speed with which the projectile was launched and the speed with which it strikes the wall.

26) Derive the equations of motion by calculus method.

OR

(a) Distinguish between distance and displacement.

(b) The displacement (in metre) of a particle, moving along X-axis is given by $x = 18t + 5t^2$. Calculate (1) the instantaneous velocity at $t=2s$, (2) the average velocity between $t=2s$ and $t=3s$ and (3) the instantaneous acceleration

Blue print for Half yearly Exam (XI Physics)

Chapter name	1 Marks	2 marks	3 marks	4 marks	5 marks	Total Marks
Units and dimensions	2	2	3			15
Motion in one dimension	1	1	3		5	17
Motion in a plane	1	1	3	4	5	21
Laws of motion	1	1	3		5	17
	5	5	12	1	3	70