

14/9

1st Term
Class XI
Physics

Time 3 Hrs

M. Marks: 70

General Instructions

- Q.No. 1 to 5 are of 1 mark each.
- Q.No.6 to 10 are of 2 marks each.
- Q.No.11 to 22 are of 3 marks each.
- Q.No.23 is value based question of 4 marks.
- Q.No.24 to 26 are of 5 marks each
- Use Log Tables wherever required.

Q1 Three different objects of masses m_1 , m_2 & m_3 are allowed to fall from the same point O along three different frictionless paths. What will be the ratio of the speeds of these three objects on reaching the ground?

$v = u + at$
 $v = t$
 $v = gt$

Q2 What is the angle between the vectors $\vec{A} \times \vec{B}$ and $\vec{B} \times \vec{A}$? 1

Q3 A piece of cork is floating on the water. What is the net force acting on it? 1

Q4 What is the work done by force of tension in the string of simple pendulum? 1

Q5 A clock fitted with a pendulum and another with a spring indicate correct time on earth. Which shows correct time on the moon? 1

Q6 State the principle of homogeneity of dimensions. Explain it with suitable example. 2

Q7 9.74g of a substance occupies 1.2cm^3 . Express its density by keeping the significant figures in view. 2

Q8 A bullet travelling with a velocity of 16ms^{-1} penetrates a tree trunk and comes to rest in 0.4m. Find the time taken during the retardation. $\leftarrow 2^{ms}$ 2

- Q9 A woman weighing 50Kgf stands on a weighing machine laced in a lift. What will be the reading of the machine, when the lift is (i) moving upwards with uniform velocity of 5ms^{-1} and (ii) moving downwards with uniform acceleration of 1ms^{-2} ? Take $g=10\text{ms}^{-2}$. 2
- Q10 Distinguish between conservative and non-conservative forces. 2
- Q11 Explain any three advantages of SI over other systems of units. 3
- Q12 What are the dimensional formula of (i) pressure (ii) power. Show that the maximum error in the sum of the two quantities is equal to the sum of the absolute errors in the two individual quantities. 3
- Q13 Define relative velocity. Deduce an expression for relative velocity of one object with respect to another in terms of their velocities relative to the earth. 3
- Q14 Draw velocity time graph of a body moving with uniform acceleration and use this graph to prove $s = ut + \frac{1}{2} a t^2$. 3
- Q15 Distinguish between average speed and instantaneous speed of an object. What does the speedometer of a car measure- average speed or instantaneous speed? 3
- Q16 State parallelogram law of vector addition. Show that resultant of two vectors \vec{A} and \vec{B} inclined at an angle θ is $R = (A^2 + B^2 + 2AB\cos\theta)^{\frac{1}{2}}$. 3
- Q17 If $\vec{A} = 2\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{B} = 3\hat{i} + 2\hat{j} + 4\hat{k}$, then find the value of $(\vec{A} + \vec{B}) \times (\vec{A} - \vec{B})$. 3
- Q18 Draw the graph of equation $F_s = -kx$, where F_s is the spring force and x is the displacement of block from equilibrium position. Using this graph show that maximum work done by the spring at x_m is $w_s = -kx_m^2/2$ (k =spring constant) 3
- Q19 What do you mean by an elastic collision? Prove that bodies of identical masses exchange their velocities after head-on elastic collision. 3
- Q20 A ball at rest is dropped from a height 12m. It loses 25% of its kinetic energy in striking the ground. Find the height to which it bounces. How do you account for loss in kinetic energy? 3
- Q21 Find the potential energy of a system of four particles, each of mass m , placed at the vertices of a square of side l . Also obtain the potential at the center of the square. 3

Q22 State Kepler's law of periods and hence derive Newton's law of gravitation from it. 3

Q23 Two boys A and B jumped from a certain height. Boy A fell on a cemented floor and got injured. Boy B fell on a heap of sand and was not injured. Boy B started laughing at boy A. Satish was also watching both the boys. He immediately took boy A to the nearby dispensary. The doctor treated the boy A.

(i) Why was boy A injured and not boy B?

(ii) What values are shown by Satish?

4

Q24 A projectile is fired with a velocity u making an angle θ with a horizontal. Show that its trajectory is a parabola.

Prove that the maximum horizontal range is four times the maximum height attained by the projectile when fired at an inclination so as to have maximum horizontal range.

OR

5

Justify the statement that a uniform circular motion is an accelerated motion.

Derive an expression for centripetal acceleration of an object in uniform circular motion in a plane.

Q25 What is meant by banking of roads? What is the need for banking a road? Obtain an expression for maximum speed with which a vehicle can safely negotiate a curved road banked at an angle θ so that less wear and tear of the tyres occur.

OR

5

State the principle of the conservation of linear momentum. Explain, why the gun recoils when a bullet is fired from it?

State and prove impulse momentum theorem.

Q26 Obtain an expression for the acceleration due to gravity on the surface of the earth in terms of mass of the earth and its radius. Show that acceleration due to gravity at a height h above the surface of the earth has same value as that at depth $d = 2h$ below the surface of the earth.

OR

5

What is escape velocity? Obtain an expression for the escape velocity for the earth. The escape velocity from the earth for a body of $20g$ is 11Kms^{-1} . What will be its value for a body of $100g$?