SEMESTER–ONE

PHYSICS

Class XI

Sample Paper—1

Max. Marks: 50 **Time Allowed: 90 minutes**

General Instructions:

(i) This question paper consists of 40 questions in 4 sections.

(ii) Section A consists of 10 Objective type questions carrying 1 mark each.

(iii) Section B consists of 10 Fill in the blanks type questions carrying 1 mark each.

(iv) Section C consists of 10 True or False statement type questions carrying 1 mark each.

(v) Section D consists of 10 Short answer type questions carrying 2 marks each.

Section A

Select and write one most appropriate option out of the four options given for each of the questions 1–10.

1. A body moves in a plane so that the displacements along the x and y axes are given by $x = 3t^3$ and $y = 4t^3$. The velocity of the body is

(a) $9\ t$ (b) $15\ t$

(c) $15\ t^2$ (d) $25\ t^2$.

2. A particle is travelling along a straight line OX. The distance x (in metre) of the particle from O at a time t is given by $x = 37 + 27t - t^3$ where t is time in second. The distance of the particle from O when it comes to rest is

(a) 81 m (b) 91 m

(c) 101 m (d) 111 m.

3. A bullet on penetrating 30 cm into its target loses its velocity by 50%. What additional distance will it penetrate into the target before it comes to rest?

(*a*) 30 cm (*b*) 20 cm

(*c*) 10 cm (*d*) 5 cm.

4. A circular disk of radius R is made from an iron plate of thickness *t* and another disc Y of radius 4R is made from an iron plate of thickness $\frac{t}{4}$. Then the relation between the moments of inertia I_X and I_Y is

(*a*) $I_Y = I_X$ (*b*) $I_Y = 64\ I_X$

(*c*) $I_Y = 32\ I_X$ (*d*) $I_Y = 16\ I_X$.

5. A thin circular ring of mass M and radius *r* is rotating about its axis with a constant angular velocity ω. Four objects, each of mass *m*, are kept gently on the opposite ends of two perpendicular diameters of the ring. The angular velocity of the ring will be

(*a*) $\frac{M\omega}{4m}$ (*b*) $\frac{M\omega}{4m}$

(*c*) $\frac{(M+4m)\,\omega}{M}$ (*d*) $\frac{(M-4m)\,\omega}{M+4m}$.

6. One end of a thin uniform rod of length L and mass M_1 is riveted to the centre of a uniform circular disc of radius *r* and mass M_2 so that both are coplanar. The centre of mass of the combination from the centre of the disc is (assume that the point of attachment is at the origin)

(*a*) $\frac{L(M_1+M_2)}{2M_1}$ (*b*) $\frac{LM_1}{2(M_1+M_2)}$

(*c*) $\frac{2(M_1+M_2)}{LM_1}$ (*d*) $\frac{2LM_1}{(M_1+M_2)}$.

7. A ball of mass M falls from a height *h* on a floor for which the coefficient of restitution is *e*. The height attained by the ball after two rebounds is

(*a*) $e^2 h$ (*b*) eh^2

(*c*) $e^4 h$ (*d*) h/e^4.

8. Consider the following two statements:

A. Linear momentum of a system of particle is zero. Then

B. Kinetic energy of a system of particles is zero. Then

(*a*) A does not imply B but B implies A.

(*b*) A implies B and B implies A.

(*c*) A does not imply B and B does not imply A.

(*d*) A implies B but B does not imply A.

9. A spring of spring constant 5×10^3 N m^{-1} is stretched initially by 5 cm from the unstretched position. Then the work required to stretch it further by another 5 cm is

(*a*) 25.00 N m (*b*) 6.25 N m

(*c*) 12.50 N m (*d*) 18.75 N m.

10. A neutron makes a head-on elastic collision with a stationary deuteron. The fractional energy loss of the neutron in the collision is

(*a*) 16/81 (*b*) 8/9

(*c*) 8/27 (*d*) 2/3.

Section B

Fill in the blanks with a suitable word for each of the questions 11–20.

11. In the entire path of a projectile, the quantity that remains unchanged is _____ .

12. Among the following, the vector quantity is _____ .

13. If the velocity (in m s^{-1}) of a particle is given by $4.0\hat{i} + 5.0t\hat{j}$, then the magnitude of its acceleration (in m s^{-2}) is _____ .

14. A mass of 1 kg is just able to slide down the slope of an inclined rough surface when the angle of inclination is 60°. The minimum force necessary to pull the mass up the inclined plane is (g = 10 m s^{-2}) is _____ .

15. A block of mass m is resting on a smooth horizontal surface. One end of a uniform rope of mass (m/3) is fixed to the block, which is pulled in the horizontal direction by applying a force F at the other end. The tension in the middle of the rope is _____ .

16. A motor car is moving with a speed of 20 m s^{-1} on a circular track of radius 100 m. If its speed is increasing at the rate of 3 m s^{-1}, its resultant acceleration is _____ .

17. A body of mass 3 kg is under a constant force which causes a displacement s (in m) in it, given by the relation $s = \frac{1}{3}t^2$, where t is in second. Work done by the force in 2 s is _____ .

18. A 2 kg block slides on a horizontal floor with a speed of 4 m s^{-1}. It strikes a uncompressed spring, and compresses it till the block is

motionless. The kinetic friction force is 15 N and spring constant is 10,000 N m^{-1}. The spring compresses by _____ .

19. A spherical ball of mass 20 kg is stationary at the top of a hill of height 100 m. It rolls down a smooth surface to the ground, then climbs up another hill of height 30 m and finally rolls down to a horizontal base at a height of 20 m above the ground. The velocity attained by the ball is _____ .

20. A bread gives a boy of mass 40 kg an energy of 21 kJ. If the efficiency is 28%, then the height which can be climbed by him using this energy is nearly _____ .

Section C

State whether the following statements are true or false for each of the questions 21–30.

21. Scalar quantities are those physical quantities which have only Magnitude.

22. A quantity can be a vector only if it obeys the laws of scalar addition.

23. The horizontal motion of the projectile is uniform motion.

24. The vectors into which the given vector is splitted are called component scalers.

25. The vector sum of all the external forces acting on the rigid body must be zero.

26. Friction is a retarding force.

27. The limiting friction acts tangentially to the two surfaces in contact.

28. The total quantity of motion possessed by a moving body is known as the momentum of the body.

29. A collision is said to be an inelastic collision if the kinetic energy is conserved in the collision.

30. If the rigid body is at rest, then the equilibrium of the rigid body is called static equilibrium.

Section D

Answer each of the questions 31–40.

31. Name a quantity which remains unchanged during the flight of an oblique projectile.

32. At which point of the projectile path, the speed is minimum?

33. Is it possible that a particle moving with constant speed may not have a constant velocity? If yes, give an example.

34. A stone is rotated in a circle with a string. The string suddenly breaks. In which direction will the stone move?

35. A rough inclined plane is placed on a cart moving with a constant velocity u on horizontal ground. A block of mass M rests on the incline. Is any work done by force of friction between the block and incline? Is there then a dissipation of energy?

36. A ball is thrown horizontally and at the same time another ball is dropped from the top of a tower. (*i*) Will both the balls hit the ground with the same velocity? (*ii*) Will both the balls reach the ground at the same time?

37. What is the effect of air resistance on the time of flight and horizontal range of the projectile?

38. A stone tied to the end of a string is whirled in a horizotnal circle. When the string breaks, the stone flies away tangentially. Why?

39. What is the acceleration of a train travelling at 40 m s^{-1} as it goes round a curve of 160 m radius?

40. The potential energy of two atoms separated by a distance x is given by U = $-\frac{A}{x^6}$ where A is a positive constant. Find the force exerted by one atom on another atom.