SEMESTER–ONE

PHYSICS

Class XI

Sample Paper—2

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 projectile is given an initial velocity of $(\hat{i} + 2\hat{j})$ m s^{-1} where $\hat{i}$ is along the ground and $\hat{j}$ is along the vertical. If g = 10 m s^{-2}, the equation of its trajectory is

(*a*) $4y = 2x - 25x^2$ (*b*) $y = x - 5x^2$

(*c*) $y = 2x - 5x^2$ (*d*) $4y = 2x - 5x^2$

2. The distance x covered by a particle varies with time t as $x^2 = 2t^2 + 6t + 1$. Its acceleration varies with x as

(*a*) x (*b*) x^2

(*c*) x^{-1} (*d*) x^{-3}

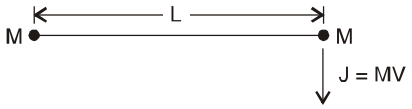
3. Two circular loops A and B of radii r_A and r_B respectively are made from the same uniform wire. The ratio of their moments of inertia

about axes passing through their centres and perpendicular to their planes is $I_B/I_A = 8$. Then (r_B/r_A) =

(*a*) 2 (*b*) 4

(*c*) 6 (*d*) 8.

4. Consider a body, shown in figure, consisting of two identical balls, each of mass M connected by a light rigid rod. If an impulse J = MV is imparted to the body at one of its ends, what would be its angular velocity?



(*a*) V/L (*b*) 2V/L

(*c*) V/3L (*d*) V/4L.

5. A turntable rotates about a vertical axis with a constant angular speed ω. A circular pan rests on the turntable and rotates along with the table. The bottom of the pan is covered with a uniform thick layer of ice which also rotates with the pan. The ice starts melting. The angular speed of the turntable

(*a*) decreases (*b*) increases

(*c*) remains the same as ω (*d*) data insufficient.

6. Water is poured from a height of 10 m into an empty barrel at the rate of 1 litre per second. If the weight of the barrel is 10 kg, the weight indicated at time t = 60 s will be

(*a*) 71.4 kg (*b*) 68.6 kg

(*c*) 70.0 kg (*d*) 84.0 kg.

7. A stationary particle explodes into two particles of masses m_1 and m_2 which move in opposite directions with velocities v_1 and v_2. The ratio of their kinetic energies E_1/E_2 is

(*a*) m_2/m_1 (*b*) m_1/m_2

(*c*) 1 (*d*) m_1v_2/m_2v_1.

8. A body of mass m has a kinetic energy equal to one-fourth kinetic energy of another body of mass $m/4$. If the speed of the heavier body is increased by 4 m s^{-1}, its new kinetic energy equals the original kinetic energy of the lighter body. The original speed of the heavier body in m s^{-1} is

(*a*) 8 (*b*) 6

(*c*) 4 (*d*) 2.

9. A toy gun has a spring of force constant k. After charging the spring by compressing it through a distance of x, the toy releases

a shot of mass m vertically upwards. Then the shot will travel a vertical height of

(*a*) $\frac{2mg}{kx^2}$ (*b*) $\frac{kx^2}{mg}$

(*c*) $\frac{kx}{mg}$ (*d*) $\frac{kx^2}{2mg}$.

10. A particle moves in a straight line with retardation proportional to its displacement. Its loss of kinetic energy for any displacement x is proportional to

(*a*) x^2 (*b*) e^x

(*c*) x (*d*) $\log_e x$.

Section B

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

11. The horizontal range of a projectile is maximum when the angle of projection is _____ .

12. The graph between displacement and time for a particle moving with uniform acceleration is a _____ .

13. A body of mass 0.05 kg is observed to fall with an acceleration of 9.5 m s^{-2}. The opposing force of air on the body is _____ (g = 9.8 m s^{-2}).

14. A car of mass 1500 kg is moving with a speed of 12.5 m s^{-1} on a circular path of radius 20 m on a level road. The value of coefficient of friction between the tyres and road, so that the car does not slip, is _____ .

15. A force of 200 N is required to push a car of mass 500 kg slowly at constant speed on a level road. If a force of 500 N is applied, the acceleration of the car (in m s^{-2}) will be _____ .

16. When a bucket containing water is rotated fast in a vertical circle of radius R, the water in the bucket doesn't spill provided _____ .

17. An insect is crawling up on the concave surface of a fixed hemispherical bowl of radius R. If the coefficient of friction is $\frac{1}{3}$, then the height up to which the insect can crawl is nearly _____ .

18. A windmill converts wind energy into electrical energy. If v is the wind speed, electrical power output is proportional to _____ .

19. An automobile travelling with a speed of 60 km h^{-1}, can brake to stop within a distance of 20 m. If the car is going twice as fast, *i.e.*, at 120 km h^{-1}, the stopping distance will be _____ .

20. A uniform chain of length 2 m is kept on a table such that a length of 60 cm hangs freely from the edge of the table. The total mass of the chain is 4 kg. The work done in pulling the entire chain on the table is _____ .

Section C

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

21. The magnitude of the vector is called the modulus of the vector.

22. If a body is projected at a certain angle with the horizontal, then the body is called an horizontal projectile.

23. An object follows a circular path at a constant speed, the motion of the object is called uniform oscillatory motion.

24. A particle executing such a motion is always in *stable equilibrium* about its mean position.

25. The sum of the vectors remains the same in whatever order they may be added.

26. A couple is a set of three equal (in magnitude), opposite (in direction) forces having different lines of action.

27. When potential energy is minimum, the particle is said to be in stable equilibrium.

28. The tyres of the vehicles are made rough to increase friction.

29. The time rate of change of momentum of a body is proportional to the impressed force.

30. To every action, there is always an unequal (in magnitude) and opposite (in direction) reaction.

Section D

Answer each of the questions 31–40.

31. Name five physical quantities which change during the motion of an oblique projectile.

32. A body is projected so that it has maximum range R. What is the maximum height reached during the flight?

33. What is the source of centripetal force in the case of an electron revolving around the nucleus?

34. What is the effect on the direction of the centripetal force when the revolving body reverses its direction of motion?

35. Why is electrical power required at all when the elevator is descending? Why should there be a limit on the number of passengers in this case?

36. A projectile of mass m is projected with velocity v at an angle θ with the horizontal. What is the magnitude of the change in momentum of the projectile after time t?

37. The maximum horizontal range of a cannon is 4 km. What is the muzzle velocity of the shell, if g = 10 m s^{-2} ?

38. Is the angular velocity of rotation of hour hand of a watch greater or smaller than the angular velocity of Earth's rotation about its own axis?

39. (i) What is the direction of the angular velocity of the minute hand of a wall-clock?

(ii) When the car takes a turn round a curve, a passenger sitting in the car tends to slide. To which side does the passenger slide?

(iii) Comment on the statement 'sharper the curve, more is the bending'.

40. A ball, dropped from a height of 8 m, hits the ground and bounces back to a height of 6 m only. Calculate the fractional loss in kinetic energy.