Atomic Energy Central School Narora

Half yearly examination – 2018-19

Class-XI (PHYSICS)

Time: 3 hour **Maximum Marks = 70**

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 12 carry two marks each.**
4. **Question No. 13 to 24 carry three marks each.**
5. **Question No. 25 to 27 carry five marks each.**
6. **There is no overall choice. However, an internal choice has been provided in one question of two marks and all three questions in five marks each. You have to attempt only one of the choices in such question.**

1) Electrons revolve round the nucleus of the atom. What is the source for centripetal force?

2) Two masses are in the ratio 1:5. What is the ratio of their inertia?

3) What is the significance of the –ve sign in W= -mgd?

4) When a body accelerates by αt, what is the velocity after time't', when it starts from rest?

5) If $x = a+bt+ct^2$, where x is in metres and t is in second, what will be the dimensional formula of c?

6) A swimmer can swim with velocity of 10 km/h w.r.t. the water flowing in river with velocity of 5km/h. In what direction should he swim to reach the point on the other bank just opposite to hisstarting point?

7) Is friction a necessary evil? Justify.

8) How high must a body be lifted to gain an amount of potential energy equal to the kinetic energyit has, when moving at speed 20 m/s. The value of acceleration due to gravity at that place is $g = 9.8\ m/s^2$.

9) The velocity of particle is $v = 5 + 2(a_1 + a_2t)$ where a_1 and a_2 are constants and t is the time. Whatis the acceleration of the particle?

OR

Derive a relation for the distance covered in the nth second by a uniformly accelerated body.

10) The radius of curvature of a concave mirror measured by spherometer is given by $R = \frac{l^2}{6h} + \frac{h}{2}$ .The values of l and h are 4 cm and 0.065 cm respectively. Compute the percentage error in measurement of radius of curvature. $given\ \Delta l = 0.1\ cm\ and\ \Delta h = .001\ cm.$

11) Distinguish between conservative and non- conservative forces with examples.

12) Write the limitation of dimensional analysis.

13) Define work- energy theorem. Derive expression for variable force.

14) A bob of mass m is suspended by a light string of length l. It is imparted a horizontal velocity v_0 at the lowest point A so that it completes a semi-circular trajectory in the vertical plane with the string becoming slack only on reaching the topmost point C. This is shown in the figure. Obtain an expression for (i) horizontal velocity v_0 (ii) the speed at point B and C (iii) the ratio of the kinetic energies K_B/K_C at B and C.

15) Show that Newton's 2nd law is a real law.

16) Define angle of repose. Prove that angle of repose is equal to angle of friction.

17) State parallelogram law of vector addition. Show that resultant of two vectors A and B inclined at an angle θ is R=$\sqrt{A^2 + B^2 + 2ABcos\theta}$.

18) If two resistances of values R1 = (2.0 ± 0.1) Ω and R2 = (12.3 ± 0.2) Ω are put (i) in parallel and (ii) in series, find the error in the equivalent resistance.

19) If the velocity of light (c), the gravitational constant (G) and Planck's constant (h) be chosen as the fundamental units. Find the dimensions of mass and time in the new system.

20) Define Significant figure and write rules for significant figure with example.

21)Two towns A and B are connected by regular bus service with a bus leaving in either directionevery T minutes. A man cycling with a speed of 20 km/h in the direction A to B notices that a bus goes past him every 18 min in the direction of the motion, and every 6 min in the opposite direction. What is the period T of the bus service and with what speed do the busses ply on the road?

22) 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 ofthe ball?

23) The speed of a train increases at a constant rate α from zero, to v, and then remains constantfor 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/α + 1/β)

24) Derive an expression for the acceleration of a body of mass 'm' moving with a uniform speed 'v'in a circular path of radius 'r'.

25)A projectile is fired at an angle θ with horizontal

(a) Show that its trajectory is a parabola.

(b) Obtain expression for :

(1) The maximum height attained

(2) The time of its flight and

(3) The horizontal range

(c) At what value of θ is the horizontal range maximum?

OR

Prove the following:

(a) For the two angles of projection θ and (90 – θ) with the same velocity v,

(1) Range Is same

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

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

26) (a) Define friction.

(b) Show that kinetic friction is less than the static friction.
(c) Establish that static friction is a self-adjustable force.
(d) Write the basic laws of limiting friction.

OR

Derive expression for velocity of a car on a banked circular road having coefficient of frictions.

Hence write the expression for optimum velocity.

27) A mass m moving with a speed u collides with a similar mass m at rest, elastically and obliquely. Prove that they will move in directions making an angle $\frac{\pi}{2}$ with each other.

OR

Define elastic and inelastic collisions. Write their basic characteristics. A bullet is fired into a block of wood. If it gets totally embedded in it and the system move together as one entity, then statewhat happens to the initial kinetic energy and linear momentum of the bullet?