

Half Yearly Examination – 2014
 Physics (Theory) XI SET-I

Time : 3hrs

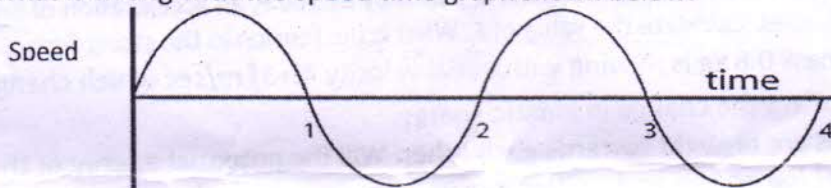
MM:70

General Instructions:

- All the questions are compulsory.
- Questions 1 to 5 are very short answer type questions and carry one mark each.
- Questions 6 to 10 carry two marks each.
- Questions 11 to 22 carry three marks each.
- Questions 23 is value based questions carry four marks.
- Questions 24 to 26 carry five marks each.
- 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 questions.
- Use of calculators is not permitted. However, you may use log tables if necessary.

SECTION - A *1m*

- What is percentage error in a volume of sphere, when error in measuring its radius is 2%?
- What is wrong with the speed time graph shown below:



- What is represented by the area under uniform acceleration time graph?
- An impulsive force of 100N acts on a body for 1s. What is the change in its linear momentum?
- If \vec{A} , \vec{B} and \vec{C} are mutually perpendicular vectors, then find the value of $\vec{A} \cdot (\vec{B} + \vec{C})$.

SECTION - B *2m*

- Check the correctness of the equation $S_{nth} = u + a(2n-1)/2$, where u is initial velocity, a is acceleration and S_{nth} is the distance travelled by the body in n^{th} second.
 - With what acceleration should a box descend so that a block of mass M placed in it exerts a force $mg/4$ on the floor of the box.
- OR
- The resistance $R = V/I$, where $V = (100 \pm 5)V$ and $I = (10 \pm 0.2)A$. Find the percentage error in R .
 - The displacement x of the body in motion is given by $x = A \sin(\omega t + \theta)$. Determine the time at which the displacement is maximum.
 - Draw the position time graph for an object moving with negative acceleration.
 - Draw the graph between applied force and force of friction. What does the graph signify?

SECTION - C *3m*

- Calculate the dimensions of universal gravitation constant if its value in SI units is 6.67×10^{-11} . What will be its value in CGS systems.

$$C = \frac{Q}{V}$$

12. A Capacitor of Capacitance $C=(2.0 \pm 0.1) \mu\text{F}$, is charged to a voltage $V=(20 \pm 0.5) \text{V}$. Calculate charge Q with error limits.

OR

A person travels along a straight line for the first half length with velocity v_1 , and second half length with velocity v_2 . What is the mean velocity of the person.

13. The greatest and least resultant of two forces acting at a point is 10N and 6N respectively. If each force is increased by 3N. Find the resultant of new forces when acting at a point at an angle of 90° with each other.
14. Show that for two angles of projection the horizontal range is same.
15. Which is greater : angular velocity of the hour hand of a watch or angular velocity of earth around its own axis.
16. Two bodies are thrown with the same initial velocity at angles α and $90 - \alpha$ with the horizontal. What will be the ratio of :
- Maximum heights attained by them
 - Horizontal ranges.
17. Show dimensionally that the relation $t=2\pi l/g$ is incorrect, where l is length and t is time period of simple pendulum, g is acceleration due to gravity. Find correct form of the relation, dimensionally.
18. Two bodies whose masses are $m_1=50\text{kg}$ and $m_2=150\text{kg}$ are tied by a light string and are placed on a frictionless horizontal surface. When m_1 is pulled by a force F , an acceleration of 5m/sec^2 is produced in both the bodies. Calculate the value of F . What is the tension in the string first.
19. A body of mass 0.8kg is moving with initial velocity $4\hat{i}+3\hat{j}\text{ m/sec}$ which changes into $-6\hat{j}+2\hat{k}\text{ m/sec}$. Calculate the change in kinetic energy.
20. Two protons are brought towards each other. Will the potential energy of the system increase or decrease? If a proton and an electron be brought nearer, then?
21. What do you mean by coefficient of limiting friction? Define angle of friction. What is the relationship between angle of friction and coefficient of limiting friction?
22. What do you mean by impulse. Derive the Impulse-Momentum Theorem.

SECTION - D

23. Manoj was sitting by the side of his father, who was driving the car on the way to the town. Suddenly the car had to be turned to the right side, abruptly to save a cow running on the road. Manoj struck against the left side of the car and his elbow was bruised. Manoj was a brilliant boy and he requested his father to explain the reason. Manoj's father being a science graduate said that no actual force was involved in his collision against the car side. Actual reason of his collision is that your body was in motion in a straight line with car and tended to move in the same direction due to inertia of motion while the car turned to right side suddenly and as a result the body struck against the car wall.
- Questions:
- What quality do you notice in Manoj?
 - How did his father convince Manoj.?
 - What is "Newtons first law of motion"?

SECTION- E

24. Deduce the equations of motion by following calculus method.

OR

State parallelogram law of vectors addition. Find analytically the magnitude and direction of resultant vector.

25. Find (a) time of flight (b) max. height (c) Horizontal range of projectile projected with speed v making an angle θ with the horizontal direction from ground.

OR

What do you mean by potential energy and kinetic energy? Draw the graph between Potential Energy, Kinetic Energy and Total Energy. Show that total energy of the body during free fall remains constant.

26. What do you mean by Elastic and Inelastic Collision. Calculate the velocities after collision in case of Elastic collision in one dimension.

OR

What do you mean by Centripetal Force and Centrifugal Force? Discuss in detail the banking of road thereby deriving the expression for velocity and $\tan\theta$