INDIAN SCHOOL SOHAR
UNIT TEST I (2023-24)
PHYSICS (042)

CLASS: XI
DATE: 21/05/2023

Max Marks: 20
Time: 40 Minutes

## General Instructions:

(i) There are 10 questions in all. All questions are compulsory.
(ii) This question paper has five sections: Section $A$, Section $B$, Section $C$, Section $D$ and Section $E$.
(iii) Section A contains six questions of one mark each, Section B contain one question of two marks, Section C contain one question of three-marks, Section D contains one case studybased question of four marks and Section $\mathbf{E}$ contain one question of five marks.
(iv) There is no overall choice. However, an internal choice has been provided in one question of five marks. You have to attempt only one of the choices in such questions.
(v) You may use log tables if necessary but use of calculator is not allowed.

| All questions are compulsory. In case of internal choices, attempt any one of them. |  |  |
| :---: | :---: | :---: |
| 1 | The velocity of a particle $v$ at an instant $t$ is given $b y=a t+b t^{2}$. The dimensions of $b$ is <br> (a) [L] <br> (b) $\left[\mathrm{LT}^{-1}\right]$ <br> (c) $\left[\mathrm{LT}^{-2}\right]$ <br> (d) $\left[\mathrm{LT}^{-3}\right]$ | 1 |
| 2 | Identify the pair whose dimensions are equal <br> (a) Torque and work <br> (b) Stress and energy <br> (c) Force and stress <br> (d) Force and work | 1 |
| 3 | An athlete completes one round of a circular track of radius $R$ in 40 seconds. What will be his displacement at the end of 2 minutes 20 seconds? <br> (a) Zero <br> (b) $2 R$ <br> (c) $2 \pi R$ <br> (d) $7 \pi R$ | 1 |
| 4 | A particle moves along a straight line such that its displacement at any time $t$ is given by $s=t^{3}-6 t^{2}$ $+3 t+4$. The velocity when the acceleration is zero is <br> (a) $2 \mathrm{~m} / \mathrm{s}$ <br> (b) $-12 \mathrm{~m} / \mathrm{s}$ <br> (c) $42 \mathrm{~m} / \mathrm{s}$ <br> (d) $-9 \mathrm{~m} / \mathrm{s}$ | 1 |

Two statements are given-one labelled Assertion (A) and the other labelled Reason ©. Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
a) Both $A$ and $R$ are true and $R$ is the correct explanation of $A$
b) Both $A$ and $R$ are true and $R$ is not the correct explanation of $A$
c) $A$ is correct but $R$ is incorrect $\quad$ d) $A$ is incorrect and $R$ is also incorrect.

5 Assertion(A): The average velocity of the object over an interval of time is either smaller than or equal to the average speed of the object over the same interval. Reason(R): Velocity is a vector quantity and speed is a scalar quantity.
$6 \quad$ Assertion(A): The position-time graph of a uniform motion in one dimension of a body can have negative slope. Reason(R): When the speed of body decreases with time, the position-time graph of the moving body has negative slope.

Section - B
7
A body, starting from rest, moves with an acceleration of $5 \mathrm{~m} / \mathrm{s}^{2}$, after 4 seconds from starting, the force accelerating the body is removed and there is no opposing force also. Draw velocity-time graph for first 8 seconds of the motion of the body and determine from the graph the distance travelled in 8 seconds.

| Section - C |  |  |
| :---: | :---: | :---: |
| 8 | A body of mass $m$ suspended from an ideal spring is executes simple harmonic oscillations The force constant of the spring $(F / L)_{-}$is $k$ and the time period of the body is $T$ show by dimensional method that the formula $T=2 \pi \mathrm{~m} / \mathrm{k}$ is incorrect. Establish its correct form. | 3 |
| Section - D (CASE STUDY) |  |  |
| 9 | To solve the mathematical problems of physical quantities, it is important to have a brief knowledge of units and dimensions. The basic concept of dimensions is that only those quantities can be added or subtracted which have the same dimension. This concept helps us to derive relationships between physical quantities. Dimensional analysis is the study of the relation between physical quantities based on their units and dimensions. It is used to convert a unit from one form to another. While solving mathematical problems, it is necessary to keep the units the same to solve the problem easily. <br> i) What are dimensionless quantities? <br> ii) Who introduced Dimensional Analysis? <br> iii) What are dimensional variables? Give any two examples <br> OR <br> Check the correctness of the following relation using dimensional analysis. <br> a) $S=u t+1 / 2 a t^{2}$ <br> b) $v^{2}-u^{2}=2$ as. | 4 |
|  | Section-E <br> In case of internal choices, attempt any one of them. |  |
| 10 | A man walks on a straight road from his home to a market 2.5 km away with a speed of $5 \mathrm{~km} \mathrm{~h}^{-1}$ Finding the market closed, he instantly turns and walks back home with a speed of $7.5 \mathrm{~km} \mathrm{~h}^{-1}$ What is the (a) Magnitude of average velocity, and (b) Average speed of the man over the interval of time (i) 0 to 30 min , (ii) 0 to 50 min , (iii) 0 to 40 min . <br> OR <br> The figure below shows the position-time graph of a body moving along a straight line. <br> i) Draw the velocity-time graph of the body. <br> ii) From the graph, find the displacement in 20 seconds. <br> iii) Also write the two differences between distance and displacement. | 5 |

INDIAN SCHOOL SOHAR
UNIT TEST I (2023-24)
PHYSICS (042)
CLASS: XI
DATE: 21/05/2023
SET-B

Max Marks: 20 Time: 40 Minutes

## General Instructions:

(i) There are 10 questions in all. All questions are compulsory.
(ii) This question paper has five sections: Section $A$, Section $B$, Section $C$, Section $D$ and Section $E$.
(iii) Section $\mathbf{A}$ contains six questions of one mark each, Section $\mathbf{B}$ contain one question of two marks, Section C contain one question of three marks, Section D contains one case studybased question of four marks and Section $\mathbf{E}$ contain one question of five marks.
(iv) There is no overall choice. However, an internal choice has been provided in one question of five marks. You have to attempt only one of the choices in such questions.
(v) You may use log tables if necessary but use of calculator is not allowed.

## Section - A

All questions are compulsory. In case of internal choices, attempt any one of them.

| 1 | The respective number of significant figures for the numbers $23.023,0.0003$ and $2.1 \times 10^{-3}$ are <br> (a) 5, 1, 2 <br> (b) 5, 1, 5 <br> (c) 5, 5, 2 <br> (d) 4, 4, 2 | 1 |
| :---: | :---: | :---: |
| 2 | If the velocity v (in $\mathrm{cms}^{-1}$ ) of a particle is given in terms of t (in second) by the relation $\mathrm{v}=\mathrm{at}+\frac{b}{t+c}$ then the dimensions of $a, b$ and $c$ <br> (a) [L], [LT], [ $\mathrm{T}^{2}$ ] <br> (b) $\left[L^{2}\right],[T],\left[L T^{-2}\right]$ <br> (c) [LT $\left.{ }^{2}\right],[L T],[L]$ <br> (d) $\left[\mathrm{LT}^{-2}\right],[\mathrm{L}],[\mathrm{T}]$ | 1 |
| 3 | The $x$-t equation is given as $x=2 t+1$. The corresponding $v-t$ graph is <br> (a) a straight line passing through origin <br> (b) a straight line not passing through origin <br> (c) a parabola <br> (d) None of the above | 1 |
| 4 | The speed-time graph of a particle moving along a fixed direction is as shown in the figure. The distance traversed by the particle between $t=0 \mathrm{~s}$ to $\mathrm{t}=10 \mathrm{~s}$ is <br> (a) 20 m <br> (b) 40 m <br> (c) 60 m <br> (d) 80 m | 1 |

Two statements are given-one labelled Assertion (A) and the other labelled Reason ©. Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
a) Both $A$ and $R$ are true and $R$ is the correct explanation of $A$
b) Both $A$ and $R$ are true and $R$ is not the correct explanation of $A$
c) $A$ is correct but $R$ is incorrect $\quad$ d) $A$ is incorrect and $R$ is also incorrect.

5 Assertion(A): Special functions such as trigonometric, logarithmic and exponential functions are not dimensionless. Reason(R): A pure number, ratio of similar physical quantities, such as angle

|  | and refractive index, has some dimensions. |  |
| :---: | :---: | :---: |
| 6 | Assertion(A): The v-t graph perpendicular to time axis is not possible in practice. <br> Reason(R): Infinite acceleration cannot be realized in practice. | 1 |
| Section-B |  |  |
| 7 | A bullet moving with a velocity of $10 \mathrm{~m} / \mathrm{s}$ hits the wooden plank, the bullet is stopped when it penetrates the plank 20 cm deep. Calculate retardation of the bullet. | 2 |
| Section-C |  |  |
| 8 | The frequency of vibration ( $n$ ) of a string depends upon length (I) of the string, tension/force ( T ) of the string and mass per unit length ( m ) of the string. Using the method of dimension, derive a formula for the frequency of vibration of the string. | 3 |
| Section-D (CASE STUDY) |  |  |
| 9 | To solve the mathematical problems of physical quantities, it is important to have a brief knowledge of units and dimensions. The basic concept of dimensions is that only those quantities can be added or subtracted which have the same dimension. This concept helps us to derive relationships between physical quantities. Dimensional analysis is the study of the relation between physical quantities based on their units and dimensions. It is used to convert a unit from one form to another. While solving mathematical problems, it is necessary to keep the units the same to solve the problem easily. <br> i) What are dimensionless quantities? <br> ii) Who introduced Dimensional Analysis? <br> iii) What are dimensional variables? Give any two examples <br> OR <br> Check the correctness of the following relation using dimensional analysis. <br> a) $S=u t+1 / 2 a t^{2}$ <br> b) $v^{2}-u^{2}=2 a s$. | 4 |
|  | Section-E <br> In case of internal choices, attempt any one of them. |  |
| 10 | A man walks on a straight road from his home to a market 2.5 km away with a speed of $5 \mathrm{~km} \mathrm{~h}^{-1}$ Finding the market closed, he instantly turns and walks back home with a speed of $7.5 \mathrm{~km} \mathrm{~h}^{-1}$ What is the (a) Magnitude of average velocity, and (b) Average speed of the man over the interval of time (i) 0 to 30 min , (ii) 0 to 50 min , (iii) 0 to 40 min . <br> OR <br> The figure below shows the position-time graph of a body moving along a straight line. <br> i) Draw the velocity-time graph of the body. <br> ii) From the graph, find the displacement in 20 seconds. <br> iii) Also write the two differences between distance and displacement. | 5 |

