INDIAN SCHOOL AL WADI AL KABIR

UNIT TEST (2024-25)
Sub: Physics (042)
SET-I

Date: 30.05.2024   Max. Marks: 30
Class: XI   Time Allowed: 01 hour

GENERAL INSTRUCTIONS

(1) There are 15 questions in all. All questions are compulsory.
(2) This question paper has 5 sections. Section A, Section B , Section C ,Section D and Section E
(3) All sections are compulsory.
(4) Section A contains 8 questions, 6 MCQ and 2 Assertion -reasoning based of 1 mark each. Section B contains 2 questions of 2 marks each .Section C contains 3 questions of 3 marks each. Section D contains 1 case study based question of 4 marks. Section E contains 1 long answer question of 5 marks.
(5) There is no overall choice .However, an internal choice has been provided in 1 question in section B ,1 question in section C,1 question in section D and 1 question in section E.You have to attempt only one of the choices in such questions.
(6) Use of calculators is not allowed

SECTION A   [1x 8 = 8]

[1] Of the following situations, which one is impossible?

[a] A body having velocity east and acceleration east.
[b] A body having velocity east and acceleration west.
[c] A body having zero velocity and non-zero acceleration.
[d] A body having constant velocity and variable acceleration.

[2] An object is moving along a path ABCA with constant speed of 10m/s , then
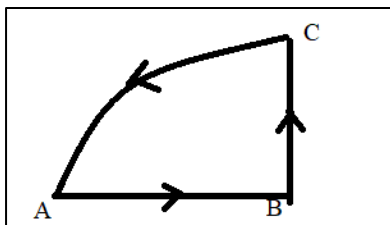
[a] the acceleration of the object while moving along the path ABCA is non zero.
[b] the acceleration of the object along the path ABC is zero.
[c] there must be some acceleration along the path ABC due to the change in direction.
[d] both [a] & [c].

[3] A body of mass 5g is thrown vertically upwards and reaches the maximum height .What is its [i] initial velocity [ii] final velocity at the highest point [iii] acceleration at the highest point?

[a] initial velocity is non -zero, final velocity is zero, acceleration is zero.

[b] initial velocity is zero, final velocity is zero, acceleration is non zero.

[c] initial velocity is non -zero, final velocity is zero, acceleration is non zero.

[d] initial velocity is non -zero, final velocity is non-zero, acceleration is zero.

[4] A stone is dropped into water from a bridge 44.1 m above the water. Another stone is thrown vertically downward 1 sec later. Both strike the water simultaneously. What was the initial speed of the second stone?   [g $= 9.8\frac{m}{s^2}$]

   [a] 17.26 m/s   [b] 32 m/s   [c] 12.25 m/s   [d] 9.24m/s

[5] If the magnitude of two vectors are 2 and 3 and the magnitude of their scalar product is 3 $\sqrt{2}$, then find the angle between the vectors.

   [a] $\theta = 0$ [b] $\theta = 45$ [c] $\theta = 60$ [d] $\theta = 90$

[6] Two vectors of equal magnitude have a resultant equal to either of them in magnitude. The angle between them is:

   [a] $\cos\theta = 0$ [b] $\cos\theta = -\frac{1}{2}$ [c] $\cos\theta = -\frac{\sqrt{3}}{2}$ [d] $\cos\theta = -\frac{1}{\sqrt{2}}$

ASSERTION AND REASON

For questions 7 to 8, two statements are given -one labelled Assertion [A] and other labelled Reason [R]. Select the correct answer to these questions from the options as given below.

[a] If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

[b] If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

[c] If Assertion is true but Reason is false.

[d] If both Assertion and Reason are false

[7] **Assertion[A]:** A body can have acceleration even if its velocity is zero at that instant.
      Reason[R]: The body will momentarily be at rest when it reverses its direction of motion.

[8] **Assertion[A]:** When a body is dropped or thrown horizontally from the same height, it would reach the ground at the same time.
    Reason[R]: Horizontal velocity has no effect on the vertical direction.

SECTION B   [2x2 = 4]

[9] What is the difference between average velocity and instantaneous velocity ?Write a condition in which instantaneous velocity and average velocity are the same.

[10] Show that there are two angles of projection for which the horizontal range of a projectile is the same.
OR

   There are two angles of projection for which horizontal range is the same.Show that product of their time of flight is directly proprotionl to the horizontal range.

[11] With the help of a velocity- time graph,

derive the equations, [i] $v = u + at$ [ii] $s = ut + \frac{1}{2}at^2$

[12] State triangle law of vector addition. Derive an expression to find the resultant vector 'R' of 2 vectors $\vec{P}$ and $\vec{Q}$ acting simultaneously at a point making an angle $'\theta'$ between them.

[13] A ball is thrown vertically upwards with a velocity of 20m/s from the top of a building .The height of the point from where the ball is thrown is 25m from the ground.
[a] How high will the ball rise ?
[b] What is the time taken by the ball to reach the maximum height ?
[c] What is the time taken by the ball to travel from the maximum height to the ground? [$g = 10\frac{m}{s^2}$]

OR

A hiker stands on the edge of a cliff 490m above the ground and throws a stone horizontally with an initial speed of 15m/s.
[a] Find the time taken by the stone to reach the ground.
[b] What is the horizontal distance covered by the stone from the foot of the cliff?
[c] What is the final vertical velocity of the stone just before it touches the ground? [$g = 9.8\frac{m}{s^2}$]

SECTION D [CASE STUDY]   [4 ×1 = 4]

[14] The variation of speed or velocity of a moving body with respect to time can be represented graphically and the graph thus obtained is called velocity – time graph. This graph is very useful whether the body is in uniform motion or non -uniform motion. The shape of the graph is different for different situations.

[i] The instantaneous velocity of a moving body can be determined by
[a] finding the area under the velocity- time graph.
[b] finding the area under the displacement time -graph.
[c] finding the slope of the tangent drawn to the velocity-time graph.
[d] finding the slope of the tangent drawn to the displacement-time graph.

[ii] A stone is dropped from the top of a building and it touches the ground. Then the corresponding velocity -time graph is
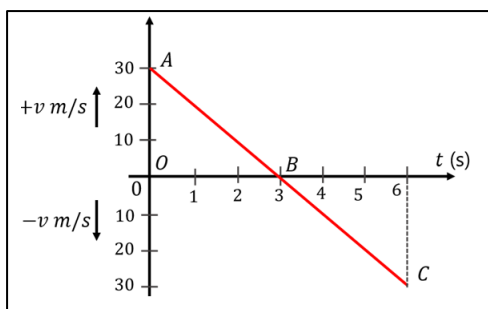
[a]

[b]

[c]

[d]
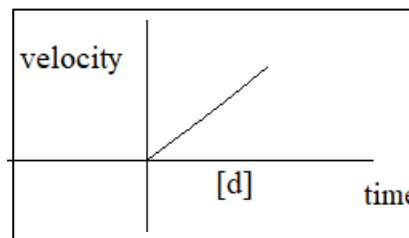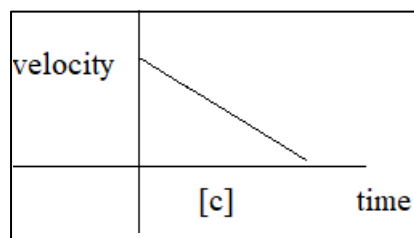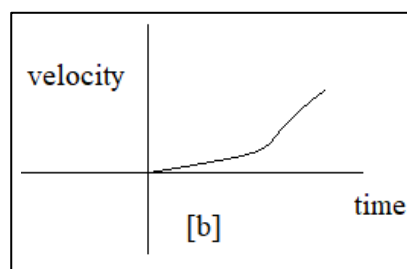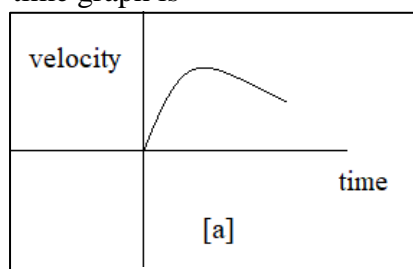
   [a] graph [a]   [b] graph [b]   [c] graph [c]   [d] graph [d]

[iii] Given below is a v – t graph, find the (i) displacement in first 6 seconds and (ii) acceleration during the time interval from 3 to 6 seconds.

[a] displacement is 90 m and acceleration is $10 \frac{m}{s^2}$

[b] displacement is 0 m and acceleration is $10 \frac{m}{s^2}$

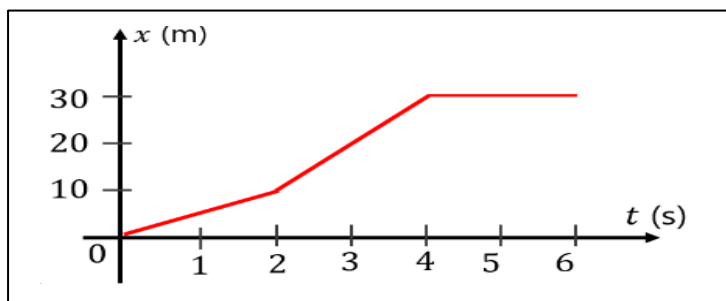[c] displacement is 10 m and acceleration is $0 \frac{m}{s^2}$

[d] displacement is 45 m and acceleration is $10 \frac{m}{s^2}$

OR

[iii] The x - t (distance- time graph) of an object moving in a straight line is shown. Calculate the average velocity in the time interval.

(i)   t = 2s to t = 4 s

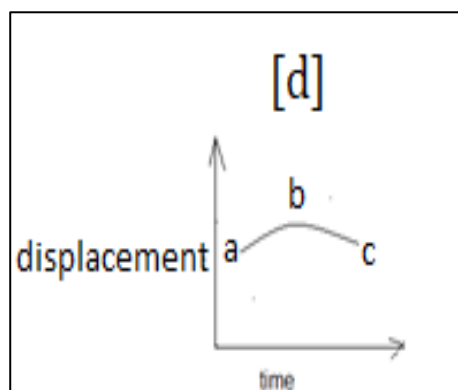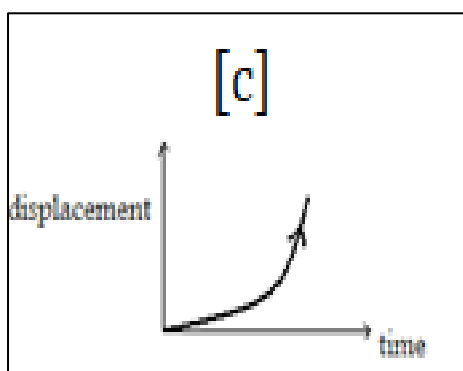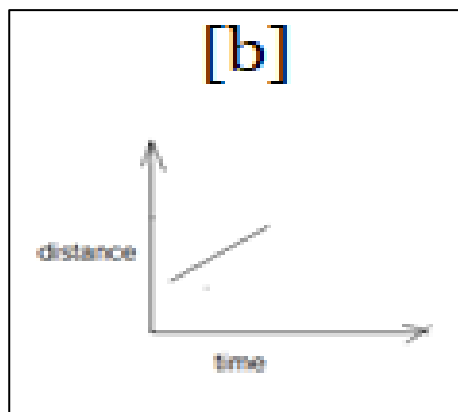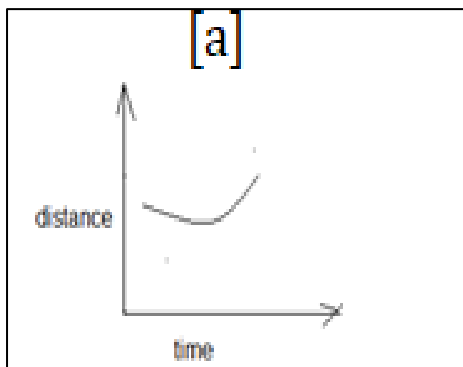(ii)   t = 4s to t = 6 s

[a] 10 m/s & 0 m/s

[b] 0 m/s & 10m/s

[c] 5 m/s & 0 m/s

[d] 0 m/s & 5 m/s

[iv] Select the graph for a body moving with negative acceleration.

[a] graph [a]   [b] graph [b]   [c] graph [c]   [d] graph [d]

SECTION E [5×1 = 5]

[15] What is a projectile? Show that the path traced by a projectile is a parabola. What will be the effect on horizontal range of a projectile when its initial velocity is doubled, keeping the angle of projection same?

OR

[i] Derive an expression for the time taken by a projectile to reach the maximum height.
[ii] Derive an expression for the horizontal range of a projectile.
What will be the effect on the maximum height of a projectile when its angle of projection is changed from 30^0 to 60^0, keeping the same initial velocity of projection?