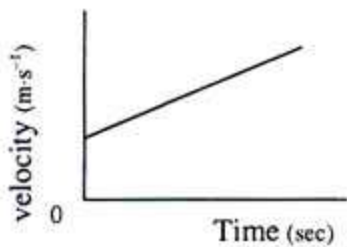
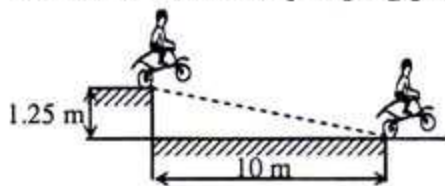


Chapter-3: Dynamics

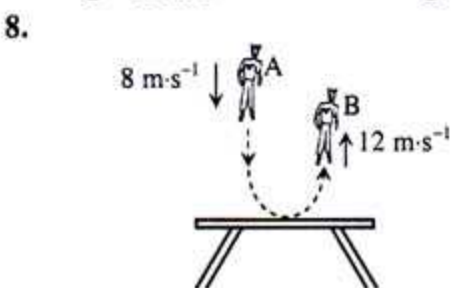
- Which one below is an example of oscillatory motion? [All Board-18]
 - Motion of the hand of a clock
 - Motion of the earth around the sun
 - Motion of an electric fan
 - Motion of a tuning fork
- Which of the following gives the time to reach maximum altitude for an object thrown vertically upward with velocity u ? [R.B.-16]
 - $\frac{u^2}{2g}$
 - $\frac{u}{2g}$
 - $\frac{2u}{g}$
 - $\frac{u}{g}$
- A car travels y km in x minutes and then x km in y minutes. What is the average speed of the car? [R.B.-16]
 - $60 \text{ m}\cdot\text{s}^{-1}$
 - $60 \text{ km}\cdot\text{s}^{-1}$
 - $60 \text{ m}\cdot\text{h}^{-1}$
 - $60 \text{ km}\cdot\text{h}^{-1}$
- Which of the following is correct according to the figure? [D.B.-16]



- The object is moving with uniform velocity
 - The object is moving with variable acceleration
 - The object is moving with uniform acceleration
 - The object is moving on a nonuniform plane
- Relation between travelled distance of a free falling object initially at rest and time is — [D.B.-16]
 - Proportional
 - Inversely proportional
 - Proportional to square of time
 - Inversely proportional to square of time
 - Maximum altitude of a projectile thrown with velocity v_0 at an angle θ_0 is — [C.B.-16]
 - $\frac{2v_0 \sin \theta_0}{g}$
 - $\frac{v_0^2 \sin^2 \theta_0}{2g}$
 - $\frac{v_0^2 \sin 2\theta_0}{g}$
 - $\frac{v_0^2 \sin 2\theta_0}{2g}$
 - In the following figure, a motorcycle stuntman jumps horizontally from a point 1.25 above ground and lands 10m from jumping point [$g = 10\text{ms}^{-2}$]

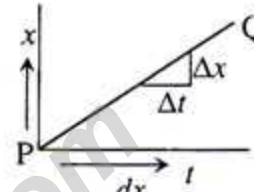


- What was his velocity at the time of jump? [C.B.-16]
- $5 \text{ m}\cdot\text{s}^{-1}$
 - $10 \text{ m}\cdot\text{s}^{-1}$
 - $15 \text{ m}\cdot\text{s}^{-1}$
 - $20 \text{ m}\cdot\text{s}^{-1}$



- The trajectory of motion between two points of a circus acrobat's jump is shown in the figure. What is the magnitude of change of velocity from A to B? [C.B.-16]
- $20 \text{ m}\cdot\text{s}^{-1}$
 - $4 \text{ m}\cdot\text{s}^{-1}$
 - $-4 \text{ m}\cdot\text{s}^{-1}$
 - $-20 \text{ m}\cdot\text{s}^{-1}$

- How long would take a stone to return back to ground if its thrown vertically upward at a velocity of $9.8 \text{ m}\cdot\text{s}^{-1}$? [Ctg.B.-16]
 - 1 s
 - 2 s
 - 4.9 s
 - 9.8 s
- Initial velocity of an object is $3\hat{i} + 4\hat{j}$ and acceleration $0.4\hat{i} + 0.3\hat{j}$. What would be the velocity magnitude after 10s? [S.B.-16]
 - 7
 - 8.5
 - 9.2
 - 9.9
- Which of the following defines velocity according to calculus? [J.B.-16]
 - $v = \frac{du}{dt}$
 - $v = \frac{ds}{dt}$
 - $v = \frac{dv}{dt}$
 - $v = \frac{da}{dt}$
- Which of the following is the slope of line PQ? [J.B.-16]



- $\frac{\Delta t}{\Delta x}$
 - $\frac{dx}{dt}$
 - $\frac{\Delta x}{\Delta t}$
 - $\frac{x}{t}$
- Which of the following is defined as the horizontal distance between launching point and landing point of a projectile? [J.B.-16]
 - Displacement
 - Distance
 - Range
 - Projection
 - Which of the following graphs indicates the change of velocity with time for an object moving with constant acceleration? [D.B.-15]
 -
 -
 -
 -
 - Which of the following is the nature of the trajectory an object thrown horizontally? [D.B.-15]
 - Elliptical
 - Parabolic
 - Circular
 - Linear
 - How much distance a free falling object of 5 kg mass initially at rest, would travel in first second?
 - 4.9 m
 - 9.8 m
 - 24.5 m
 - 49 m
 - What is the motion of an object with respect to a frame of reference called?
 - Absolute rest
 - Absolute motion
 - Relative rest
 - Relative motion
 - How many times do we have to integrate acceleration with respect to time in order to get position vector?
 - once
 - Twice
 - thrice
 - four times
 - In v vs. t graph, what does the slope drawn at any point indicate?
 - Average velocity
 - Instantaneous velocity
 - Acceleration
 - Instantaneous acceleration

20. Which of the following is the equation of a projectile thrown at velocity v_0 at an angle θ_0 with horizontal plane?

- (a) $T = \frac{2v_0 \sin \theta_0}{g}$ (b) $T = \frac{v_0 \cos \theta_0}{g}$
 (c) $T = \frac{v_0 \sin \theta_0}{g}$ (d) $T = \frac{2v_0 \cos \theta_0}{g}$

21. What is the shape of the trajectory of a projectile?

- (a) Linear (b) Parabolic
 (c) Closed curve (d) Circular

22. Which of the following is the vector form of $v = \omega r$? Or which of the following the relation between angular and linear velocity?

- (a) $\vec{v} = \vec{\omega} r$ (b) $\vec{v} = \vec{\omega} \times \vec{r}$
 (c) $\vec{v} = \vec{\omega} \cdot \vec{r}$ (d) $\vec{v} = \vec{r} \times \vec{\omega}$

23. If range and initial velocity of a projectile are 96 m and 60 m s^{-1} respectively, what is the value of launch/throwing angle?

- (a) 4.2365° (b) 5.2365° (c) 6.2365° (d) 7.5745°

24. Which of the following is an example of three dimensional motion?

- (a) Motion of a car on a straight road.
 (b) Motion of an ant on a wall.
 (c) Motion of an ant on a table.
 (d) Motion of a flying butterfly.

25. What is rate of increase of position vector with respect to time called?

- (a) Acceleration (b) Velocity
 (c) Displacement (d) Speed

26. An object is moving along a straight line whose motion can be expressed using $S = \frac{1}{2}t^3 + 2t$ equation. What would be the velocity of the object after 4s?

- (a) 46 units (b) 34 units
 (c) 28 units (d) 26 units

27. A car started moving from rest with a constant acceleration of 10 m s^{-2} . How far would it go in 10s?

- (a) 10 m (b) 20 m (c) 500 m (d) 100 m

28. An object, starting from rest, travels 2m distance in first second. How long would it take it to travel another 2m? [R.B.-17]

- (a) 0.41s (b) 1.0s (c) 1.41s (d) 2.0s

29. What would be the nature of the graph of $s = \frac{1}{2}at^2$ equation?

- (a) Linear (b) Circular (c) Elliptical (d) Parabolic

30. Velocity of a free falling object is — time.

- (a) proportional to square of
 (b) proportional to
 (c) proportional to square root of
 (d) inversely proportional

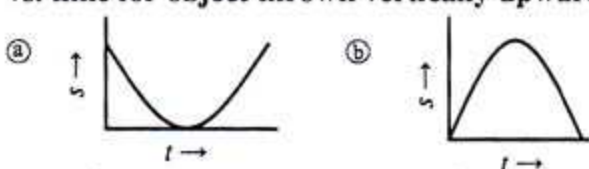
31. Which of the following expresses acceleration of a projectile?

- (a) $\vec{a} = g\hat{i}$ (b) $\vec{a} = -g\hat{i}$ (c) $\vec{a} = -g\hat{j}$ (d) $\vec{a} = g\hat{k}$

32. At which angle would a projectile has to be thrown in order for its range to be equal to its maximum altitude?

- (a) 45° (b) 63° (c) 70.5° (d) 76°

33. Which of the following is the graph of displacement vs. time for object thrown vertically upward?



34. Acceleration can be obtained from —

- (a) area under displacement-time curve.
 (b) area under velocity-time curve.
 (c) slope of displacement-time graph
 (d) slope of velocity-time graph

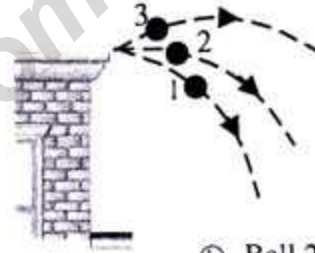
35. A truck takes 20s to travel first 80m and 10s to travel another 70m. What is the average velocity of the truck?

- (a) 0.20 m s^{-1} (b) 2.30 m s^{-1}
 (c) 4 m s^{-1} (d) 5 m s^{-1}

36. A particle started travelling from rest at uniform acceleration along a horizontal straight line. Ratio of distance travelled in 4th and 3rd second would be — [D.B.-17]

- (a) $\frac{4}{3}$ (b) $\frac{26}{9}$ (c) $\frac{7}{5}$ (d) 2

37. Three different balls are thrown from the roof of a building exactly as shown in the provided figure with same initial velocity. If air resistance is ignored, which ball would hit the ground at highest velocity?



- (a) Ball 1 (b) Ball 2
 (c) Ball 3 (d) All of them at the same velocity

38. Starting from rest, how far would a 5 kg free falling object travel in first second?

- (a) 4.9 m (b) 9.8m (c) 24.5 m (d) 49 m

39. Which of the following is the relation between linear speed v and period T for an object moving in a circular path?

- (a) $v = \frac{\pi r}{T}$ (b) $v = \frac{2\pi r}{T}$ (c) $v = \frac{T}{2\pi r}$ (d) $v = \frac{T}{\pi r}$

40. The velocity-time graph of a particle having zero initial velocity and moving with constant acceleration would be a straight line. One characteristic of this graph is —

- (a) Velocity is parallel to axis
 (b) Time is parallel to axis
 (c) Passes through origin
 (d) Intersects the velocity axis

41. What would be the launch angle to send a projectile to maximum altitude?

- (a) 0° (b) 45° (c) 90° (d) 180°

42. Who discovered the law of falling objects?

- (a) Archimedes (b) Galileo
 (c) Newton (d) Kepler

43. A particle would circle around a central point with constant velocity if —

- i. acceleration always act toward the center
 ii. velocity changes at same rate per second
 iii. angular velocity is constant.

Which of the following is correct?

- (a) i and ii (b) i & iii
 (c) ii and iii (d) i, ii & iii

44. Which of the following is the equation of maximum altitude for projectile?

- (a) $\frac{v_0 \sin \theta_0}{g}$ (b) $\frac{2v_0 \sin \theta_0}{g}$
 (c) $\frac{(v_0 \sin \theta_0)^2}{2g}$ (d) $\frac{v_0^2 \sin 2\theta_0}{g}$

45. An object is thrown vertically upward with initial velocity $40 \text{ m}\cdot\text{s}^{-1}$ and it returned to the thrower after some time. What is the average velocity of the object?

- (a) 0 (b) $20 \text{ m}\cdot\text{s}^{-1}$
 (c) $40 \text{ m}\cdot\text{s}^{-1}$ (d) $80 \text{ m}\cdot\text{s}^{-1}$

46. What is displacement per unit time called?

- (a) Velocity (b) Acceleration
 (c) Speed (d) Distance

47. If $\vec{r} = 2t\hat{i} + 3t^2\hat{j}$ indicates position vector, then which of the following would be velocity?

- (a) $2\hat{i} + 6t\hat{j}$ (b) $6\hat{i} + 2t\hat{j}$
 (c) $3\hat{i} + 2t\hat{j}$ (d) $2\hat{i} + 3t\hat{j}$

48. Which of the following is the dimension of acceleration?

- (a) LT (b) LT^{-1} (c) LT^{-2} (d) L^{-2}T

49. At the highest point in the trajectory of a projectile, — would be zero. [R.B.-16]

- i. horizontal component of velocity
 ii. vertical component of velocity
 iii. horizontal component of acceleration

Which of the following is correct?

- (a) i & ii (b) ii & iii
 (c) i & iii (d) i, ii & iii

50. In case of velocity of projectile —

- i. Horizontal component doesn't change with time.
 ii. Vertical component doesn't change with time
 iii. Resultant magnitude changes with time.

Which of the following is correct?

- (a) i & ii (b) i & iii
 (c) ii & iii (d) i, ii & iii

51. For any object moving with linear motion —

- i. the object moves along a straight line.
 ii. motion of object is bound to a straight line.
 iii. motion of object is bound to a plane.

Which of the following is correct?

- (a) i & ii (b) i & iii
 (c) ii & iii (d) i, ii and iii

52. Average acceleration can be determined from/by —

- i. the slope of position vs time graph.
 ii. dividing change of velocity with time.
 iii. the slope of velocity vs time

Which of the following is correct?

- (a) i & ii (b) i & iii
 (c) ii & iii (d) i, ii & iii

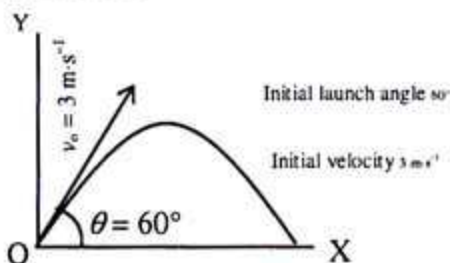
53. For free falling objects, —

- i. velocity is variable
 ii. acceleration is constant
 iii. displacement is proportional of square of time.

Which of the following is correct?

- (a) i & ii (b) i & iii
 (c) ii & iii (d) i, ii & iii

Answer the following two questions in light of the stimulus provided:

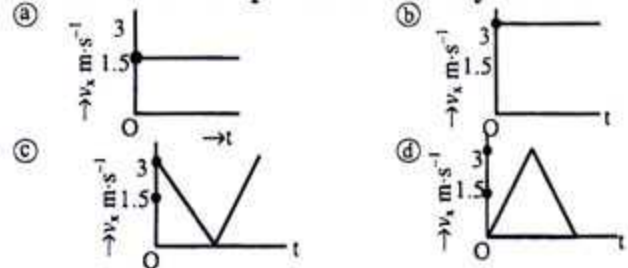


[@ B.-15]

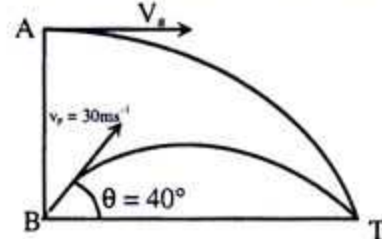
54. How long would it take the projectile to reach maximum altitude?

- (a) 0.26 sec (b) 0.34 sec
 (c) 0.53 sec (d) 0.79 sec

55. Which of the following figures would be the graph of horizontal component of velocity vs. time?



Read the stem below and answer question no. 56 and 57 : [All Board-18]



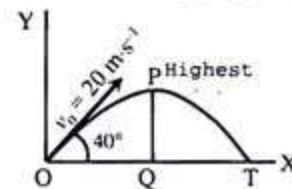
Two objects are thrown from the points A and B, according to the diagram.

56. The vertical component of velocity of the object, after 1 sec of being thrown from B is —

- (a) $9.48 \text{ m}\cdot\text{s}^{-1}$ (b) $16.18 \text{ m}\cdot\text{s}^{-1}$
 (c) $19.28 \text{ m}\cdot\text{s}^{-1}$ (d) $25.98 \text{ m}\cdot\text{s}^{-1}$

57. If the two objects take the same time which hitting the target T then —

- (a) $v_x = v_h \cos \theta$ (b) $v_h = v_x \sin \theta$
 (c) $v_x = v_h \sin \theta$ (d) $v_h = v_x \cos \theta$



According to the figure, a stone is thrown at $20 \text{ m}\cdot\text{s}^{-1}$ at 40° angle from point O.

Answer the questions 58 and 59 in light of stimulus:

58. $OQ = ?$

- (a) 12.86 m (b) 20.1 m
 (c) 128.56 m (d) 196.96 m

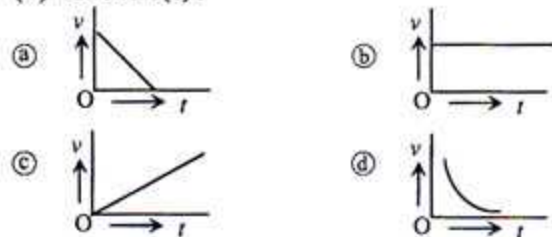
59. How long would it take the object to reach T?

- (a) 1.43 sec (b) 2.86 sec
 (c) 8.26 sec (d) 2.62 sec

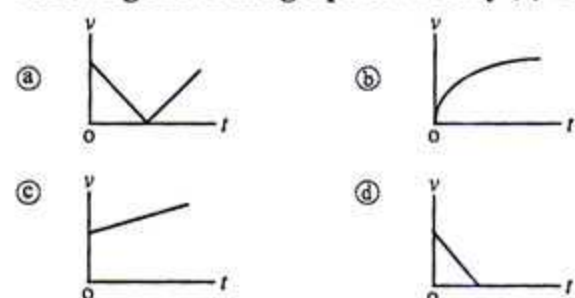
Answer the questions 60 and 61 in light of stimulus.

A car is travelling with constant velocity [J.B.-16]

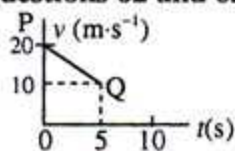
60. Which of the following shows the graph of velocity (v) vs. time(t)?



61. Later on, due to mechanical fault, it travels with uneven velocity (reduced). In this case, which of the following shows the graph of velocity (v) vs. time(t)?



Answer to questions 62 and 63 according to stimulus:



[Ctg.B.-16]

62. Which of the following equations is valid for graph PQ?

- (a) $s = vt$ (b) $v = at$
 (c) $v = v_0 + at$ (d) $v = v_0 - at$

63. What is the magnitude of deceleration of moving particle along line PQ?

- (a) $20 \text{ m}\cdot\text{s}^{-2}$ (b) $10 \text{ m}\cdot\text{s}^{-2}$ (c) $4 \text{ m}\cdot\text{s}^{-2}$ (d) $2 \text{ m}\cdot\text{s}^{-2}$

Read the stimulus below and answer to question 64 and 65:

Position of an object is expressed with $x = (12 \text{ m}\cdot\text{s}^{-1})t - (1.2 \text{ m}\cdot\text{s}^{-2})t^2$, where position x depends on time t . [S.B.-16]

64. What would be the magnitude of velocity at time $t = 3$?

- (a) $4.4 \text{ m}\cdot\text{s}^{-1}$ (b) $4.8 \text{ m}\cdot\text{s}^{-1}$
 (c) $10.8 \text{ m}\cdot\text{s}^{-1}$ (d) $25.2 \text{ m}\cdot\text{s}^{-1}$

65. How much would be the acceleration of the object?

- (a) $-2.4 \text{ m}\cdot\text{s}^{-2}$ (b) $-4.8 \text{ m}\cdot\text{s}^{-2}$
 (c) $0.6 \text{ m}\cdot\text{s}^{-2}$ (d) $9.6 \text{ m}\cdot\text{s}^{-2}$

Read the stimulus below and answer to questions 66 and 67:

Masses of two objects are 2 kg and 5 kg respectively. Their velocities are $6 \text{ m}\cdot\text{s}^{-1}$ and $4 \text{ m}\cdot\text{s}^{-1}$.

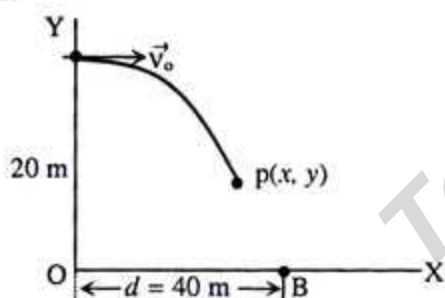
66. First one was stopped at 2m distance. What was the acceleration? [J.B.-16]

- (a) $-9 \text{ m}\cdot\text{s}^{-2}$ (b) $-1.5 \text{ m}\cdot\text{s}^{-2}$
 (c) $1.5 \text{ m}\cdot\text{s}^{-2}$ (d) $9 \text{ m}\cdot\text{s}^{-2}$

67. How much force would be required to stop the second object at same distance?

- (a) -16 N (b) -18 N (c) -20 N (d) -22 N

Answer questions 68 and 69 following the direction provided:

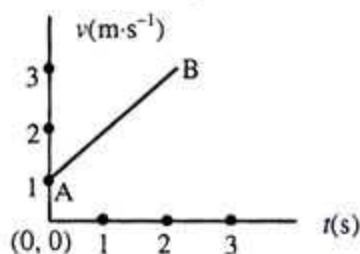


68. $v_0 = ?$

- (a) $10 \text{ m}\cdot\text{s}^{-1}$ (b) $20 \text{ m}\cdot\text{s}^{-1}$
 (c) $40 \text{ m}\cdot\text{s}^{-1}$ (d) $60 \text{ m}\cdot\text{s}^{-1}$

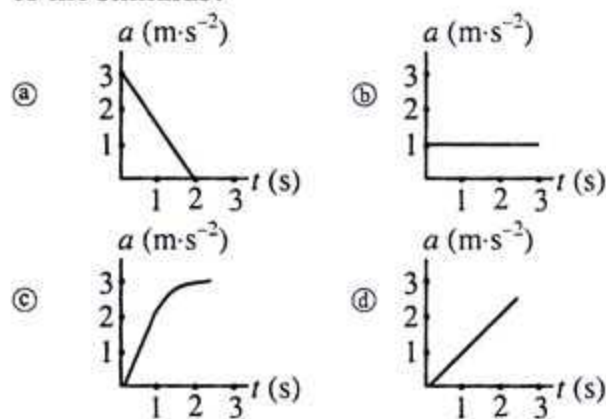
69. Thrown object would —

- (a) fall to ground before reaching target B.
 (b) fall to ground far from B.
 (c) fall vertically on B
 (d) fall on B at an angle



Answer to questions 70 and 71 according to the graph above: [Ctg.B.-15]

70. Which of the following figures is correct according to the stimulus?



71. Which of the following is the distance travelled in section AB?

- (a) 2 m (b) 3 m (c) 4 m (d) 6 m

Read the stimulus below and answer questions 72 and 73 :

Position vector of a moving particle at any moment is given by —

$$\vec{r} = \hat{i}\cos 5t + \hat{j}\sin 5t. [D.B.-15]$$

72. Which of the following would be the instantaneous velocity of the particle?

- (a) $5(\hat{j}\cos 5t - \hat{i}\sin 5t)$ (b) $(\hat{j}\cos 5t - \hat{i}\sin 5t)$
 (c) $5(\hat{i}\cos 5t + \hat{j}\sin 5t)$ (d) $(\hat{j}\cos 5t + \hat{i}\sin 5t)$

73. Field of vector \vec{r} is —

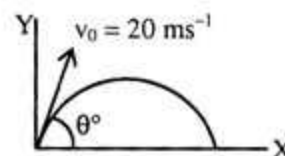
- i. solenoidal ii. nonrotating
 iii. rotating

Which of the following is correct?

- (a) i (b) ii
 (c) iii (d) i, ii & iii

Read the stimulus given and answer questions 74 and 75 : Not considering air resistance, a stone is thrown from point P as shown in the figure. T is the highest point in the trajectory of the stone and it reaches point Q right before touching the ground

[D.B.-15]



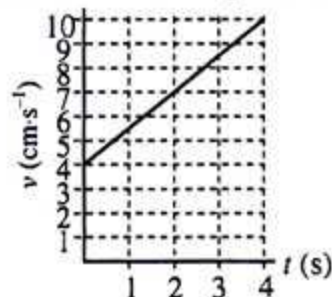
74. Maximum horizontal range of the stone?

- (a) 81.6 m (b) 40.8 m (c) 28.8 m (d) 2.04 m

75. Which of the following is a nature of vertical component of velocity of stone?

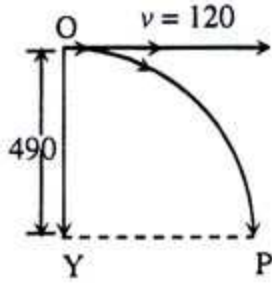
- (A) Zero at T
 (B) Higher in point T then point Q
 (C) Higher in point Q then point T
 (D) Equal in Q and T

Read the stimulus given and answer to question 76 and 77 :



76. Initial velocity? [C.B.-15]
 Ⓐ $0 \text{ cm}\cdot\text{s}^{-2}$ Ⓑ $2 \text{ cm}\cdot\text{s}^{-2}$ Ⓒ $4 \text{ cm}\cdot\text{s}^{-2}$ Ⓓ $6 \text{ cm}\cdot\text{s}^{-2}$ Ⓒ
77. Acceleration? [C.B.-15]
 Ⓐ $1.5 \text{ cm}\cdot\text{s}^{-1}$ Ⓑ $4 \text{ cm}\cdot\text{s}^{-1}$ Ⓒ $6 \text{ cm}\cdot\text{s}^{-1}$ Ⓓ $8 \text{ cm}\cdot\text{s}^{-1}$ Ⓓ

Read the stimulus below and answer to questions 78 and 79:

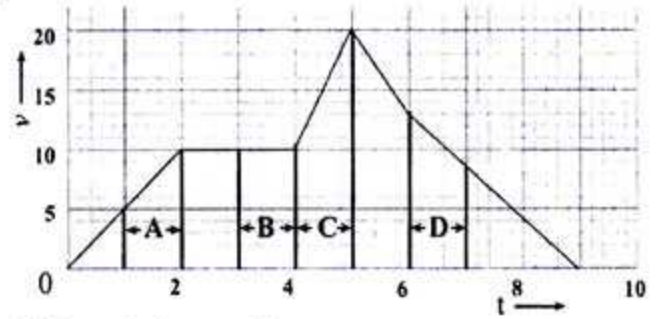


A bomber aircraft flying 490 m above ground dropped a bomb parallel to ground at $120 \text{ m}\cdot\text{s}^{-1}$ velocity. P is a point on ground surface.

78. When will the bomb hit the ground? [J.B.-15]
 Ⓐ 0.24 sec Ⓑ 4.08 sec Ⓒ 10 sec Ⓓ 29.38 sec Ⓒ

79. Which of the following is the distance between Y and P? [J.B.-15]
 Ⓐ 120 m Ⓑ 490 m Ⓒ 1200 m Ⓓ 4900m Ⓒ

Look at the velocity-time graph given below and answer to questions 80 and 81:



80. Where is the a_{max} ?
 Ⓐ A Ⓑ B Ⓒ C Ⓓ D Ⓒ
81. Where is $a = 0$?
 Ⓐ A Ⓑ B Ⓒ C Ⓓ D Ⓑ

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