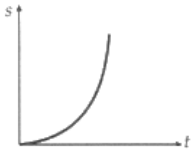
CBSE

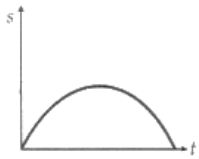
MOTION IN A STRAIGHT LINE WS 9

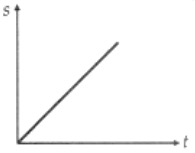
Class 11 - Physics

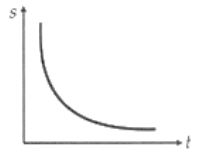
Section A

1. Which of the following graph represents uniformly accelerated motion? **[1]**

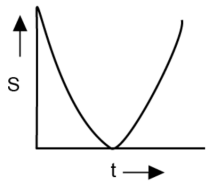
a) 

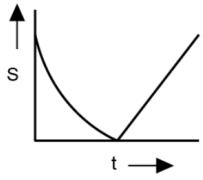
b) 

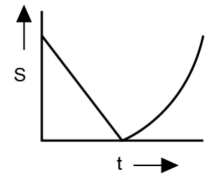
c) 

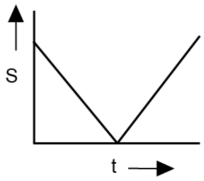
d) 

2. A ball is thrown vertically upwards. Which of the following plots represents the speed-time graph of the ball during its flight, if the air resistance is not ignored? **[1]**

a) 

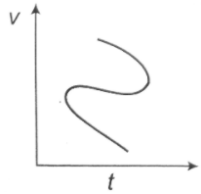
b) 

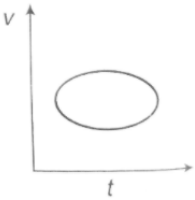
c) 

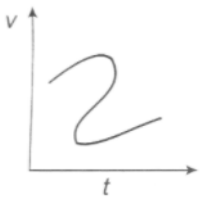
d) 

3. Which of the following velocity-time graph shows a realistic situation for a body in motion? **[1]**

a)

b) 

c) 

d) 

4. The area of the acceleration-displacement curve of a body gives: **[1]**

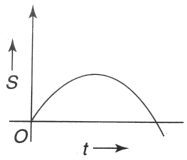
a) change in momentum per unit mass

b) impulse

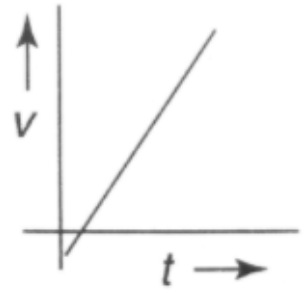
c) total change in energy

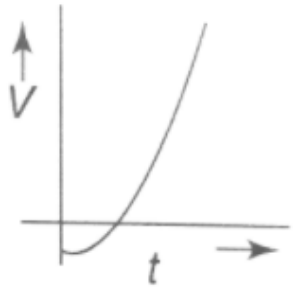
d) change in KE per unit mass

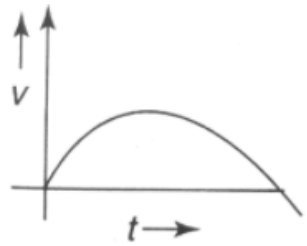
5. The graph of displacement vs. time is **[1]**

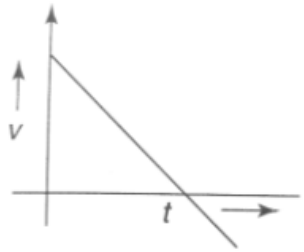


The corresponding velocity-time graph will be

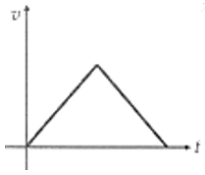
a) 

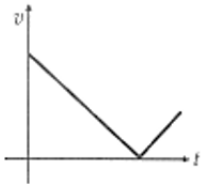
b) 

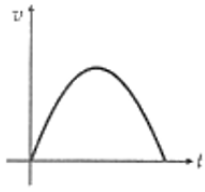
c) 

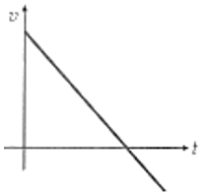
d) 

6. A ball is thrown vertically upward. Ignoring the air resistance, which one of the following plots represents the velocity-time plot for the period ball remains in air? **[1]**

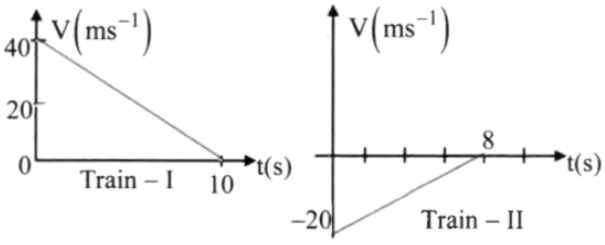
a) 

b) 

c) 

d) 

7. Two trains, which are moving along different tracks in opposite direction are put on the same track by mistake. On noticing the mistake, when the trains are 300 m apart the drivers start slowing down the trains. The graphs given below show decrease in their velocities as function of time. The separation between the trains when both have stopped is **[1]**



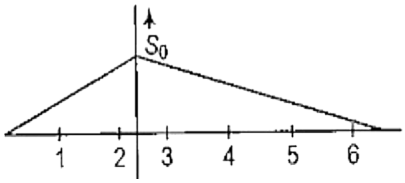
a) 120 m

b) 60 m

c) 20 m

d) 280 m

8. What will be ratio of speed in first two seconds to the speed in next 4 seconds? **[1]**



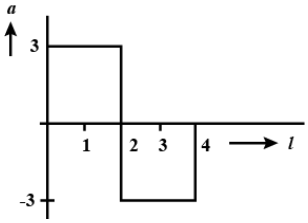
a) $\sqrt{2}$: 1

b) 3 : 1

c) 2 : 1

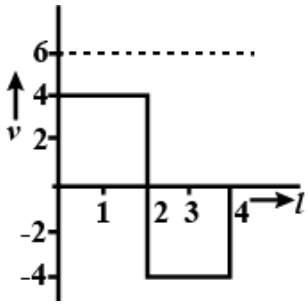
d) 1 : 2

9. A particle starts from rest at t = 0 and undergoes an acceleration **a** in ms^{-2} with time **t** in seconds which is as shown here: **[1]**

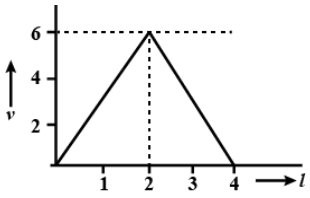


Which one of one following plots represents velocity v in ms^{-1} verses time t in seconds?

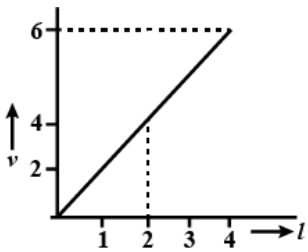
a)



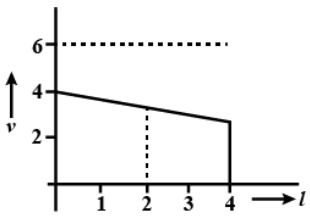
b)



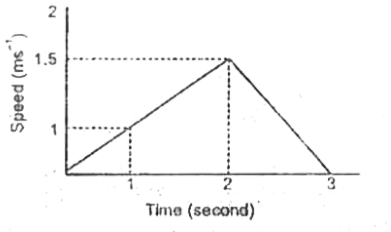
c)



d)



10. The speed-time graph of a particle moving along a solid curve is shown below. The distance traversed by the particle from t = 0 to t = 3 is: **[1]**



a) $\frac{9}{4}m$

b) $\frac{9}{5}m$

c) $\frac{9}{3}m$

d) $\frac{9}{2}m$

11. Velocity-time curve for a body projected vertically upwards is: **[1]**

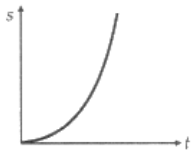
a) parabola

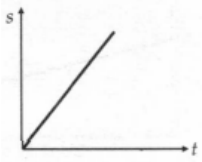
b) ellipse

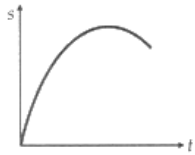
c) hyperbola

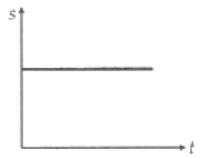
d) straight line

12. A body is travelling in a straight line with a uniformly increasing speed. Which one of the plots represents the changes in distance (s) travelled with time (t)? **[1]**

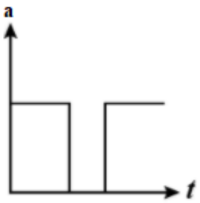
a) 

b) 

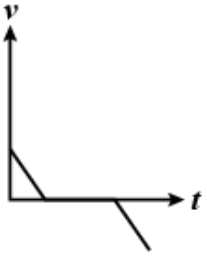
c) 

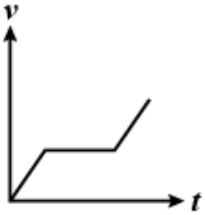
d) 

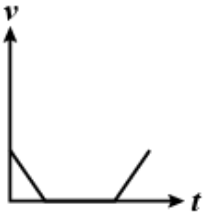
13. Acceleration-time graph of a body is shown. **[1]**

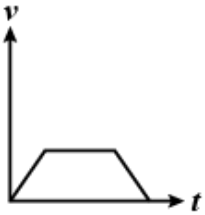


The corresponding velocity-time graph of the same body is

a) 

b) 

c) 

d) 

14. **Assertion (A):** Distance-time graph of the motion of a body having uniformly accelerated motion is a straight line inclined to the time axis. **[1]**

Reason (R): Distance travelled by a body having uniformly accelerated motion is directly proportional to the square of the time taken.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

15. **Assertion (A):** In realistic situation the x-t, v-t and a-t graphs will be smooth. This means physically that acceleration and velocity cannot change values abruptly at an instant. **[1]**

Reason (R): Changes are always continuous.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion:** Velocity-time graph for an object in uniform motion along a straight path is a straight line parallel to the time axis. **[1]**

Reason: In the uniform motion of an object, velocity increases as the square of the time elapsed.

a) If both assertion and reason are true and the

b) If both assertion and reason are true but the

reason is the correct explanation of assertion.

reason is not the correct explanation of assertion.

c) If the assertion is true but the reason is false.

d) If both assertion and reason are false.

17. **Assertion (A):** The position-time graph of a uniform motion in one dimension of a body can have negative slope. **[1]**

Reason (R): When the speed of body decreases with time, the position-time graph of the moving body has negative slope.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

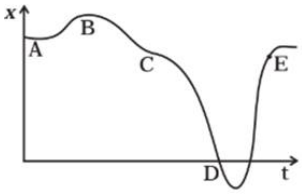
18. **State True or False:** **[1]**

(a) Position-time graph could have negative slope. **[1]**

19. **Fill in the blanks:** **[1]**

(a) The area under the acceleration-time graph gives _____ for the given time interval. **[1]**

20. A graph of x versus t is shown in Fig. Choose the correct alternatives from below. **[1]**



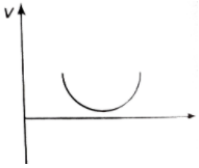
a) The particle was released from rest at t = 0.

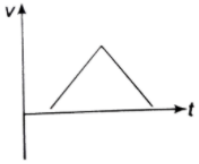
b) The speed at D exceeds that at E.

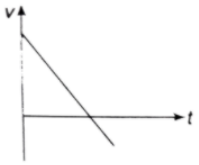
c) Average velocity for the motion between A and D is positive.

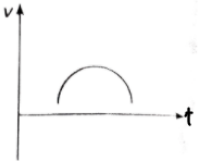
d) At C, the velocity and the acceleration vanish.

21. A particle is thrown above, then the correct v-t graph will be: **[1]**

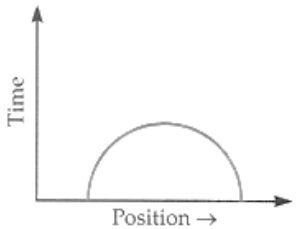
a) 

b) 

c) 

d) 

22. Is the time variation of position, shown in the adjacent figure, observed in nature? **[1]**



23. Draw v-t graph for non-uniform accelerated motion. **[1]**

24. The average velocity of a particle is equal to its instantaneous velocity. What is the nature of its displacement-time graph? **[1]**

25. A uniformly moving cricket ball is turned back by hitting it with a bat for a very short time- interval. Suggest **[1]**

acceleration-time graph for the situation.

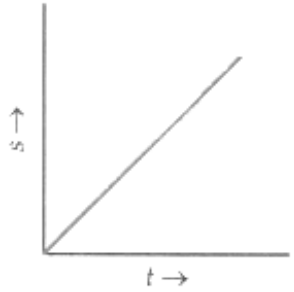
26. What is the nature of the position-time graph for a uniform motion? **[1]**

27. The v-t graphs of two objects make angles of 30° and 60° with the time-axis. The ratio of their accelerations is _____. **[1]**

28. What does the slope of the position-time graph indicate? **[1]**

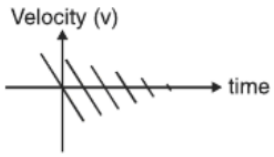
29. The displacement - time graph of a particle is parallel to time - axis, what is the velocity of the particle? **[1]**

30. The Displacement-time graph of any object is shown in the adjacent figure. Draw a velocity-time graph for this motion. **[1]**



31. Suppose the acceleration of a body varies with time. Then what does the area under its acceleration-time graph for any time interval represent? **[1]**

32. Suggest a suitable physical situation for the following graph. **[1]**



33. What is the shape of the displacement time graph for uniform linear motion? **[1]**

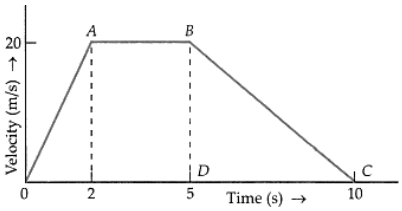
34. What does the area under the velocity-time graph represent? **[1]**

35. Draw position-time graphs for two objects having zero relative velocity. **[1]**

36. Can the position-time graph have a negative slope? **[1]**

Section B

37. The velocity-time graph of an object moving along a straight line is as shown below: **[2]**

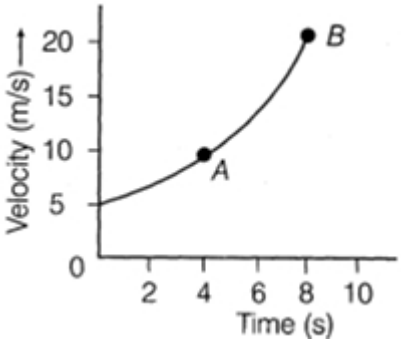


Calculate the distance covered by the object between:

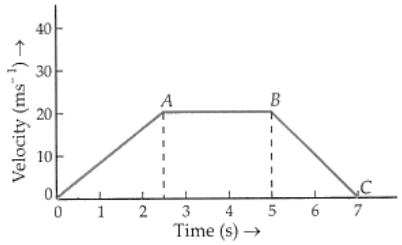
i. t = 0 to t = 5 s

ii. t = 0 to t = 10 s

38. From the figure given, find the average acceleration between points A and B. **[2]**

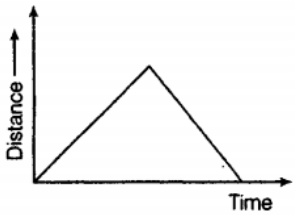


39. The velocity-time graph for a vehicle is shown in Figure. Draw acceleration-time graph from it. **[2]**

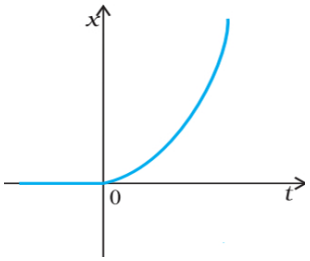


40. Derive position-time relation of a body moving with constant acceleration. **[2]**

41. The graph between total path length and time for a particle moving along a straight line as shown in figure is not possible. Explain why? **[2]**



42. In given figure shows the x-t plot of one-dimensional motion of a particle. Is it correct to say from the graph that the particle moves in a straight line for t < 0 and on a parabolic path for t > 0? If not, suggest a suitable physical context for this graph. **[2]**



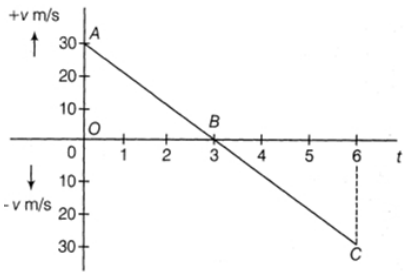
43. What are uses of a velocity-time graph? **[2]**

44. Draw displacement time graph for uniformly accelerated motion. What is its shape? **[2]**

45. Starting from rest a car accelerates uniformly with 3 ms^{-2} for 5 s and then moves with uniform velocity. Draw the distance-time graph of the motion of the car upto t = 7s. **[2]**

46. A body starting from rest accelerates uniformly along a straight line at the rate of 10 ms^{-2} for 5 s. It moves for 2 s with uniform velocity of 50 ms^{-1}. Then it retards uniformly and comes to rest in 3 s. Draw velocity-time graph of the body and find the total distance traveled by the body. **[2]**

47. With the help of below velocity-time graph, find the **[2]**

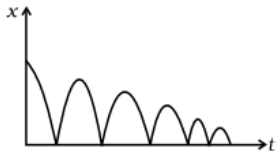


i. displacement in first three seconds and

ii. acceleration for the above graph.

48. A uniformly moving cricket ball is turned back by hitting it with a bat for a very short time interval. Show the variation of its acceleration with time. (Take acceleration in backward direction as positive). **[2]**

[2]

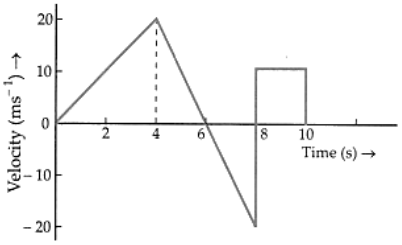
49. 

A ball is dropped and its displacement versus time graph is shown above(Displacement x is from ground and all quantities are positive upwards).

i. Plot qualitatively velocity versus time graph.

ii. Plot qualitatively acceleration versus time graph.

50. The velocity-time graph of an object moving along a straight line is as shown in Figure. Find the net distance covered by the object in the time intervals between t = 0 to t = 10 s. Also, find the displacement in time 0 to 10 s. **[2]**

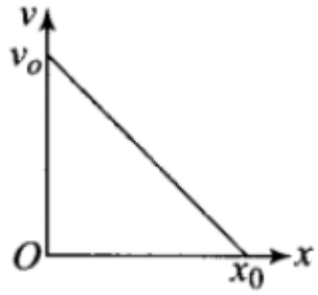


Section C

51. A train passes a station A at 40 kmh^{-1} and maintains its speed for 7 km and is then uniformly retarded, stopping at B which is 8.5 km from A. A second train starts from A at the instant the first train passes and being accelerated for some part of the journey and uniformly retarded for the rest, stops at B at the same time as the first train. Calculate the maximum speed of the second train. Use only the graphical method. **[3]**

52. Establish the kinematic equation $v^2 - u^2 = 2as$ from velocity-time graph for a uniformly accelerated motion. **[3]**

53. The velocity-displacement graph of a particle is shown in the figure. **[3]**



a. Write the relation between v and x.

b. Obtain the relation between acceleration and displacement and plot it.

54. An object is in uniform motion along a straight line. What will be position-time graph for the motion of the object if **[3]**

i. x_0 = +ve, v = +ve

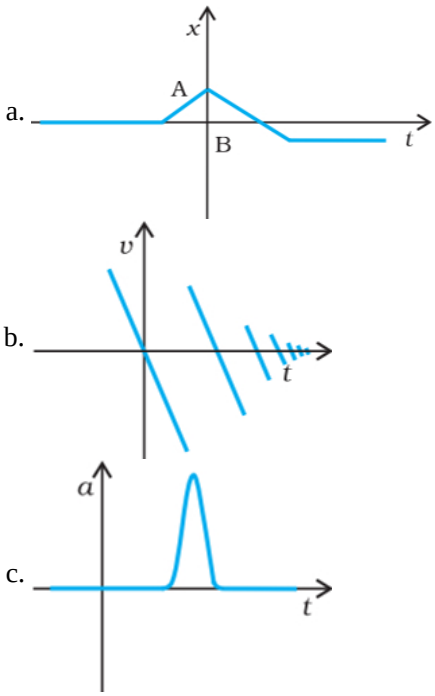
ii. x_0 = +ve, v = -ve

iii. x_0 = -ve, v = +ve

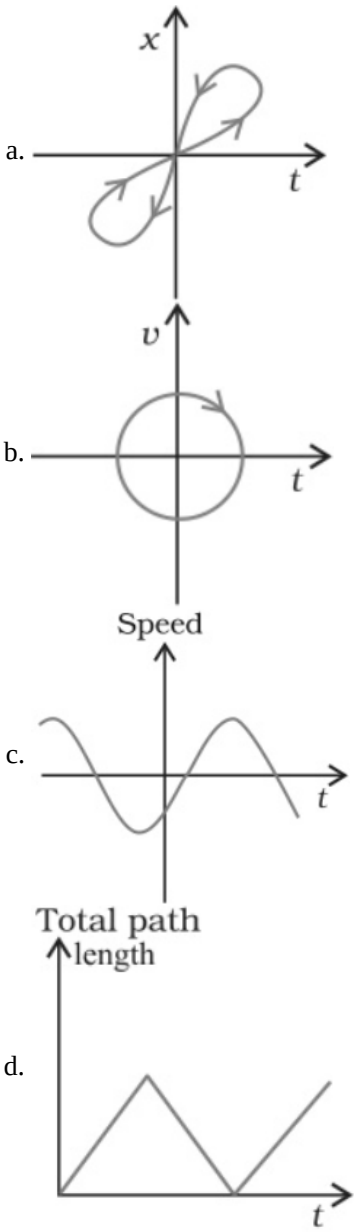
iv. both x_0 and v are negative?

The letters x_0 and v represent the position of the object at t = 0 and the uniform velocity of the object respectively.

55. Suggest a suitable physical situation for each of the following graphs: **[3]**



56. Look at the graphs (a) to (d) (figure) carefully and state, with reasons, which of these cannot possibly represent one-dimensional motion of a particle. **[3]**



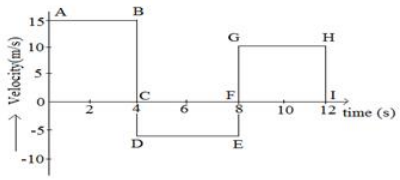
57. A train takes 4 min to go between stations 2.25 km apart starting and finishing at rest. The acceleration is uniform for the first 40 s and the deceleration is uniform for the last 20 s. Assuming the velocity to be constant for the remaining time, calculate the maximum speed, acceleration, and retardation, use the only graphical method. **[3]**

58. Velocity time graph of a moving particle is shown. Find the displacement **[3]**

i. 0 - 4 s

ii. 0 - 8 s

iii. 0 - 12 s from the graph. Also, write the differences between distance and displacement.



59. From the top of a tower, a ball is dropped to fall freely under gravity and at the same time, another ball is thrown up with a velocity of 50 ms^{-1}. Plot the position-time graph for the motion of the two balls during the time interval t = 0 to t = 5s. Take g = 10 ms^{-2}. **[3]**

60. A drunkard walking in a narrow lane takes 5 steps forward and 3 steps backward, followed again by 5 steps forward and 3 steps backward, and so on. Each step is 1 m long and requires 1 s. Plot the x-t graph of his motion. Determine graphically and otherwise how long the drunkard takes to fall in a pit 13 m away from the start. **[3]**

61. Define $v = u + at$ from velocity time graph. **[3]**

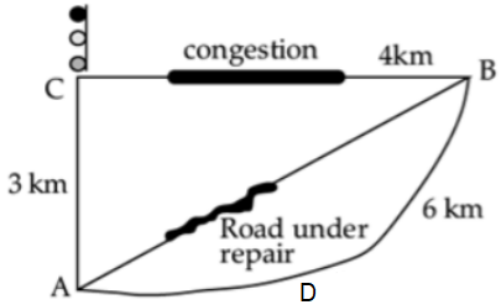
62. Show that area under the velocity-time graph of an object moving with constant acceleration in a straight line in certain time interval is equal to the distance covered by the object in that interval. **[3]**

63. A driver of a car travelling at 52 km h^{-1} applies the brakes and decelerates uniformly. The car stops in 5 seconds. Another driver going at 34 km h^{-1} applies his brakes slower and stops after 10 seconds. On the same graph paper, plot the speed versus time graph for two cars. Which of the two cars travelled farther after the brakes were applied? **[3]**

Section D

Question No. 64 to 67 are based on the given text. Read the text carefully and answer the questions: **[4]**

Tabu lives at A. He was supposed to do to his uncle's house at B. A and B is connected by a straight road 5 km long. But that day the road was under repair. So, all the buses were following a diversion via C. A to B via C is 7 km. Moreover, this route is congested There is a traffic signal at C also.



Tabu got a seat just behind the driver. He noticed that the minimum reading on the speedometer was 15km/h. But ultimately the bus took 1 hour to each B. He could not understand the fallacy.

64. What is the distance and displacement of Tabu?

65. Why the speedometer reading was minimum 15 km/h, but actual time required to cover 7 km was 1 hour?

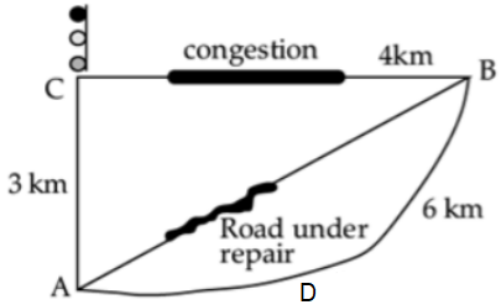
66. If the bus followed ADB path and reached B to (1 hour, find the average speed of the bus.

67. Which of the following graphs represents the motion of the bus if it covers AC distance at a speed 15 km/h and CB distance at a speed 20 km/h and total distance is covered in 1 hour including halt at traffic signal?

Section E

Question No. 68 to 72 are based on the given text. Read the text carefully and answer the questions: **[5]**

Tabu lives at A. He was supposed to do to his uncle's house at B. A and B is connected by a straight road 5 km long. But that day the road was under repair. So, all the buses were following a diversion via C. A to B via C is 7 km. Moreover, this route is congested There is a traffic signal at C also.



Tabu got a seat just behind the driver He noticed that the minimum reading in the speedometer was 15km/h. But ultimately the bus took 1 hour to each B. He could not understand the fallacy.

68. What is the distance and displacement of Tabu?

a) 5 km, 5 km
b) 7 km, 5 km
c) 7 km, 7 km
d) 5 km, 7 km

69. Why the speedometer reading was minimum 15 km/h, but actual time required to cover 7 km was 1 hour?

a) Speedometer was erratic.
b) Halt timing at the traffic signal, slow speed at the congested areas and halt-timing at the bus stops are also to be taken into account.
c) Both Speedometer was erratic and the actual distance was more than 7 km.
d) Actual distance was more than 7 km.

70. Speedometer measures

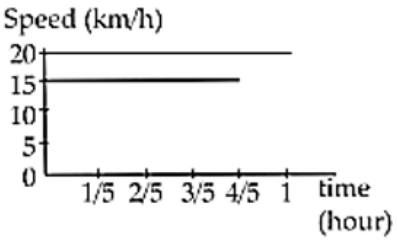
a) Speed traversed
b) Average speed
c) Instantaneous speed
d) Distance traversed

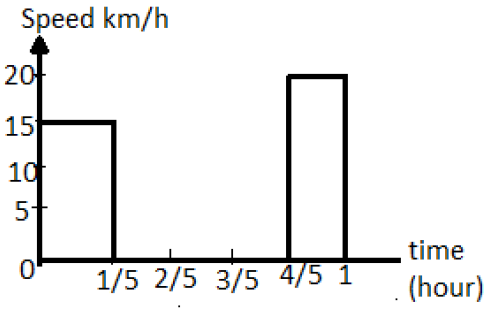
71. If the bus followed ADB path and reached B to (1 hour, then the average speed of the bus would have been

a) 7 km/h
b) 6 km/h
c) 4 km/h
d) 5 km/h

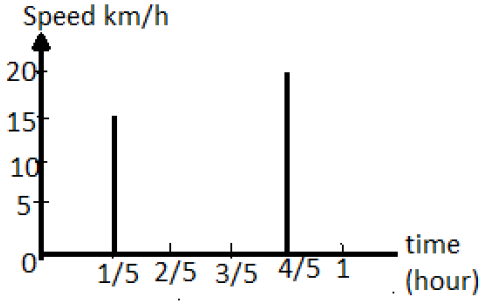
72. Which of the following graphs represents the motion of the bus if it covers AC distance at a speed CB distance at a speed 20 km/h of 15 km/h, CB distance at a speed 20 km/h and total distance is covered in 1 hour including halt at traffic signal?

a)
b)

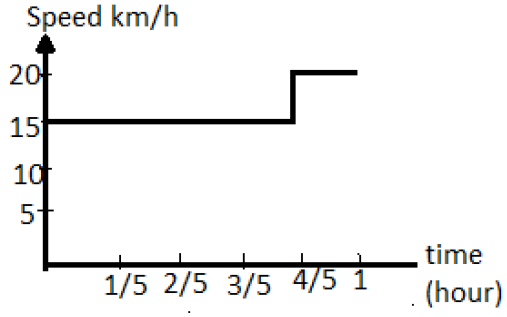




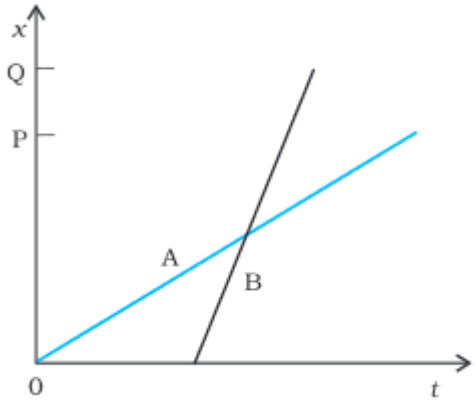
c)



d)



73. The position-time (x-t) graphs for two children A and B returning from their school O to their homes P and Q respectively are shown in Fig. Choose the correct entries in the brackets below; **[5]**



i. ($\frac{A}{B}$) lives closer to the school than ($\frac{B}{A}$)

ii. ($\frac{A}{B}$) starts from the school earlier than ($\frac{B}{A}$)

iii. ($\frac{A}{B}$) walks faster than ($\frac{B}{A}$)

iv. A and B reach home at the (same/different) time

v. ($\frac{A}{B}$) overtakes ($\frac{B}{A}$) on the road (once/twice).

74. Derive the following equations of motion for uniformly accelerated motion from velocity-time graph: **[5]**

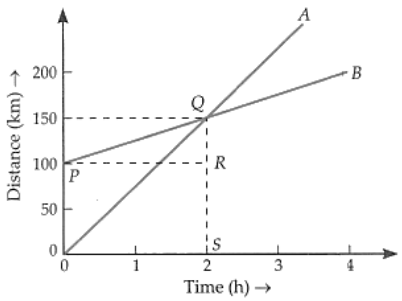
i. $v = u + at$

ii. $s = ut + \frac{1}{2}at^2$

iii. $v^2 - u^2 = 2as$

75. Figure shows the distance-time graphs of two trains, which start moving simultaneously in the same direction. **[5]**

From the graphs, find:



i. How much ahead of A is B when the motion starts?

ii. What is the speed of B?

iii. When and where will A catch B?

iv. What is the difference between the speeds of A and B?