

STUDYNEST | CLASS 11 PHYSICS QUESTION PAPER 1

Chapter 2: Motion in a Straight Line

Maximum Marks: 40 | Suggested time: 60 minutes

Instructions: Answer all questions. Show calculation steps and units. Original practice paper, not an official examination.

Section A 1-mark questions - $8 \times 1 = 8$ marks

1. Define instantaneous velocity. [1]
2. Slope of an x-t graph? [1]
3. Acceleration at constant velocity? [1]
4. Can speed be negative? [1]
5. SI unit of acceleration? [1]
6. Runner returns to start: net displacement? [1]
7. Equation linking v,u,a,t? [1]
8. Area under v-t graph? [1]

Section B 2-mark questions - $6 \times 2 = 12$ marks

9. 150 m in 30 s: average speed? [2]
10. Velocity 4 to 16 m/s in 6 s: acceleration? [2]
11. 10 m/s car brakes at 2 m/s^2 : stopping time? [2]
12. Convert 90 km/h to m/s. [2]
13. Move 8 m east then 3 m west: distance/displacement? [2]
14. From rest at 3 m/s^2 for 4 s: final speed? [2]

Section C 3-mark questions - $4 \times 3 = 12$ marks

15. $u=6 \text{ m/s}$, $a=2 \text{ m/s}^2$, $t=5 \text{ s}$: find v,s. [3]
16. Train at 20 m/s stops in 5 s: a and distance? [3]
17. Velocity rises 2 to 14 m/s in 6 s: a and displacement? [3]
18. $u=12 \text{ m/s}$, $a=1.5 \text{ m/s}^2$ for 8 s: v,s? [3]

Section D 4-mark questions - $2 \times 4 = 8$ marks

19. Car at 25 m/s brakes at 5 m/s^2 : stop time and distance? [4]
20. $x=4+3t-t^2$: v(t), a and time at rest? [4]

End of question paper.

FORMULA AND EQUATION REFERENCE

Chapter-specific equations worth knowing

- Average speed = total distance/total time; average velocity = displacement/time.
 - $a = (v-u)/t$; $v = u + at$; $s = ut + (1/2)at^2$; $v^2 = u^2 + 2as$.
 - For constant acceleration, $s = ((u+v)/2)t$.
 - At rest: $v=0$. Stopping distance under constant deceleration: $s = u^2/(2|a|)$.
 - Conversion: km/h to m/s, divide by 3.6; m/s to km/h, multiply by 3.6.
 - Displacement = final position - initial position; distance is the full path length.
- Use each equation only when its assumptions apply; keep units consistent.

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STEP-BY-STEP SOLUTIONS

Solutions are grouped here after the question paper and formula reference.

Question 1

Principle / definition: Recall the relevant definition or equation from the formula reference.

Apply it to this question: $v = dx/dt$.

Final answer: $v = dx/dt$.

Question 2

Principle / definition: Recall the relevant definition or equation from the formula reference.

Apply it to this question: Velocity.

Final answer: Velocity.

Question 3

Principle / definition: Recall the relevant definition or equation from the formula reference.

Apply it to this question: Zero.

Final answer: Zero.

Question 4

Principle / definition: Recall the relevant definition or equation from the formula reference.

Apply it to this question: No.

Final answer: No.

Question 5

Principle / definition: Recall the relevant definition or equation from the formula reference.

Apply it to this question: $m s^{-2}$.

Final answer: $m s^{-2}$.

Question 6

Principle / definition: Recall the relevant definition or equation from the formula reference.

Apply it to this question: Zero.

Final answer: Zero.

Question 7

Principle / definition: Recall the relevant definition or equation from the formula reference.

Apply it to this question: $v = u + at$.

Final answer: $v = u + at$.

Question 8

Principle / definition: Recall the relevant definition or equation from the formula reference.

Apply it to this question: Signed displacement.

Final answer: Signed displacement.

Question 9

Working: Average speed = total distance/time = $150/30 = 5$ m/s.

Final answer: 5 m/s.

Question 10

Working: $a = (v - u)/t = (16 - 4)/6 = 12/6 = 2$ m/s².

Final answer: 2 m/s².

Question 11

Working: Take final velocity $v = 0$ and acceleration $a = -2$ m/s². Using $v = u + at$: $0 = 10 - 2t$, so $t = 5$ s.

Final answer: 5 s.

Question 12

Working: 90 km/h divided by 3.6 = 25 m/s.

Final answer: 25 m/s.

Question 13

Working: Distance = $8 + 3 = 11$ m. Taking east as positive, displacement = $+8 - 3 = +5$ m, i.e. 5 m east.

Final answer: 11 m; 5 m east.

Question 14

Working: From rest $u = 0$. Use $v = u + at = 0 + 3(4) = 12$ m/s.

Final answer: 12 m/s.

Question 15

Working: $v = u + at = 6 + 2(5) = 16$ m/s. Then $s = ut + (1/2)at^2 = 6(5) + (1/2)(2)(25) = 30 + 25 = 55$ m.

Final answer: $v=16 \text{ m/s}$; $s=55 \text{ m}$.

Question 16

Working: $a=(0-20)/5=-4 \text{ m/s}^2$. Distance $s=((u+v)/2)t=((20+0)/2)(5)=50 \text{ m}$.

Final answer: $a=-4 \text{ m/s}^2$; $s=50 \text{ m}$.

Question 17

Working: $a=(14-2)/6=2 \text{ m/s}^2$. Displacement=average velocity $\times$ time $=((2+14)/2)(6)=8(6)=48 \text{ m}$.

Final answer: $a=2 \text{ m/s}^2$; displacement=48 m.

Question 18

Working: $v=12+1.5(8)=24 \text{ m/s}$. $s=ut+(1/2)at^2=12(8)+0.5(1.5)(64)=96+48=144 \text{ m}$.

Final answer: $v=24 \text{ m/s}$; $s=144 \text{ m}$.

Question 19

Working: Use $v=u+at$: $0=25-5t$, hence $t=5 \text{ s}$. Distance $s=ut+(1/2)at^2=25(5)-0.5(5)(25)=125-62.5=62.5 \text{ m}$.

Final answer: 5 s; 62.5 m; acceleration opposes motion.

Question 20

Working: Given $x=4+3t-t^2$. Differentiate: $v=dx/dt=3-2t$; acceleration $a=dv/dt=-2 \text{ m/s}^2$. At rest $v=0$, so $3-2t=0$ and $t=1.5 \text{ s}$.

Final answer: $v=3-2t$; $a=-2 \text{ m/s}^2$; $t=1.5 \text{ s}$.

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