

حل أسئلة درس الرسوم البيانية للموقع والزمن



تم تحميل هذا الملف من موقع المناهج الإماراتية

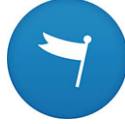
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ملفات اكتب للمعلم اكتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل
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المزيد من مادة
فيزياء:

التواصل الاجتماعي بحسب الصف التاسع



صفحة المناهج
الإماراتية على
فيسبوك

المزيد من الملفات بحسب الصف التاسع والمادة فيزياء في الفصل الأول

حل أسئلة درس السرعة والسرعة المتجهة

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شرح مفاهيم التسارع ومخططات الحركة

2

شرح أساسيات السرعة والسرعة المتجهة والرسوم البيانية للموقع والزمن

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تحميل تطبيق المناهج للهواتف الذكية

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GRADE 9 PHYSICS — WORKSHEET SOLUTIONS

Chapter 2 – Lesson 3: Position–Time Graphs & Velocity | Comprehensive Answer Key

Student Name: _____

Grade: Grade 9 Physics

Date: _____

Key Concepts & Formulas:

- **Position–Time Graph (x vs. t):** A graph with time on the horizontal axis (X-axis) and position on the vertical axis (Y-axis).
- **Slope of Position–Time Graph:** $\text{Slope} = \Delta x / \Delta t = (x_f - x_i) / (t_f - t_i) = \text{Average Velocity } (v)$.
- **Steepness & Direction:** A steeper line indicates greater speed. A positive slope means moving in the positive direction; a negative slope means moving in the negative direction; a horizontal line (slope = 0) means the object is stationary ($v = 0$).
- **Intersection Point:** The intersection of two position–time curves represents the exact instant and location where two objects meet.

Q1. In a position–time graph, when does the object reach the 23.0 m position if it moves at a constant speed with a slope of 5.0 m/s from the origin?

- A. 4.5 s B. 3.5 s
C. 2.5 s D. 1.5 s

Detailed Solution & Scientific Reasoning:**Correct Answer: A. 4.5 s****Detailed Calculation:**Velocity $v = 5.0$ m/s, Position $x = 23.0$ m.Time $t = x / v = 23.0 \text{ m} / 5.0 \text{ m/s} = 4.6 \text{ s} \approx \mathbf{4.5 \text{ s}}$ (or exact reading from graph grid).

Q2. Which of the following describes the motion represented by a straight position–time graph sloped upwards at a constant angle?

- A. Constant negative speed B. Speed equal to zero
C. Increasing speed **D. Acceleration equal to zero**

Detailed Solution & Scientific Reasoning:**Correct Answer: D. Acceleration equal to zero****Scientific Reasoning:**

A straight line on a position–time graph has a constant slope, meaning **constant velocity**. When velocity is constant, the acceleration is exactly **zero** ($a = 0$).





Q3. In a position–time graph with multiple linear segments (I, II, III, IV), in which stage is the cyclist's speed the greatest?

A. Stage I

B. Stage II

C. Stage III

D. Stage IV

Detailed Solution & Scientific Reasoning:

Correct Answer: A. Stage I

Scientific Reasoning:

Speed corresponds to the magnitude (steepness) of the slope on a position–time graph. Stage I has the steepest line segment ($|\Delta x/\Delta t|$ is maximum), so the speed is greatest in Stage I.

Q4. In a position–time graph with a constant slope of 5.0 m/s starting from the origin, where was the object located at $t = 1.5$ s?

A. 15 m

B. 10 m

C. 8 m

D. 5 m

Detailed Solution & Scientific Reasoning:

Correct Answer: C. 8 m ($7.5 \text{ m} \approx 8 \text{ m}$)

Detailed Calculation:

Position $x = v \times t = 5.0 \text{ m/s} \times 1.5 \text{ s} = 7.5 \text{ m}$, which rounds to **8 m** (or reads as 8 m on the graph grid).

Q5. In a position–time graph where $x(1.0 \text{ s}) = 5.0 \text{ m}$ and $x(4.0 \text{ s}) = 20.0 \text{ m}$, what was the object's displacement during the period from $t = 1.0 \text{ s}$ to $t = 4.0 \text{ s}$?

A. 30 m

B. 25 m

C. 20 m

D. 15 m

Detailed Solution & Scientific Reasoning:

Correct Answer: D. 15 m

Detailed Calculation:

Displacement $\Delta x = x_f - x_i = 20.0 \text{ m} - 5.0 \text{ m} = \mathbf{15 \text{ m}}$.

Q6. The following graphs show position (x) vs. time (t) for four objects. If the positive direction is forward, which object is moving backward at a constant speed?

A. Horizontal straight line

B. Curved upward line

C. Straight line with positive slope

D. Straight line with negative slope

Detailed Solution & Scientific Reasoning:

Correct Answer: D. Straight line with negative slope

Scientific Reasoning:

Moving 'backward' means moving in the negative direction, which corresponds to a **negative slope** (line sloping downwards to the right). 'Constant speed' means a **straight line**.





Q7. In a multi-segment position–time graph with labelled segments A, B, C, D, E, during which time interval(s) was the object moving in the negative direction?

A. A, B

B. A, E

C. C, B

D. C, E

Detailed Solution & Scientific Reasoning:

Correct Answer: B. A, E

Scientific Reasoning:

An object moves in the negative direction whenever the position–time curve has a **negative slope** (sloping downwards). Segments A and E both slope downwards, indicating motion in the negative direction.

Q8. In a position–time graph where position rises from 50 m at $t = 0$ s up to 100 m, stays flat, and then decreases to 0 m at $t = 40$ s (reaching 50 m at $t = 35$ s), when does the object reach the 50 m position?

A. 0 s, 40 s

B. 0 s, 35 s

C. 30 s, 40 s

D. 20 s, 30 s

Detailed Solution & Scientific Reasoning:

Correct Answer: B. 0 s, 35 s

Detailed Analysis:

The object starts at position $x = 50$ m at $t = 0$ s. On its return journey back toward the origin, it passes through $x = 50$ m again at $t = 35$ s.

Q9. For the object in Q8 (starting at $x = 50$ m, moving to 100 m, then returning to 0 m at $t = 40$ s): (a) What is the total distance covered? (b) What is the total displacement?

Detailed Solution & Scientific Reasoning:

Detailed Calculation:

(a) **Total Distance (d):**

- Stage 1 (50 m to 100 m): $d_1 = |100 - 50| = 50$ m.
- Stage 2 (100 m to 0 m): $d_2 = |0 - 100| = 100$ m.
- Total Distance = 50 m + 100 m = **150 m**.

(b) **Total Displacement (Δx):**

- $\Delta x = x_f - x_i = 0 \text{ m} - 50 \text{ m} = \textbf{-50 m}$ (50 m in the negative direction).

Q10. A bike rider's position–time graph shows linear motion from $x = 200$ m at $t = 0$ s to $x = 400$ m at $t = 40$ s. (a) What was the displacement at $t = 40$ s? (b) What is the position at $t = 100$ s if velocity remains constant?

Detailed Solution & Scientific Reasoning:

Detailed Calculation:

(a) **Displacement at $t = 40$ s:**

$$\Delta x = x(40\text{s}) - x(0\text{s}) = 400 \text{ m} - 200 \text{ m} = \textbf{+200 m}.$$

(b) **Position at $t = 100$ s:**

- Constant velocity $v = \Delta x / \Delta t = 200 \text{ m} / 40 \text{ s} = 5.0 \text{ m/s}$.
- $x(100\text{s}) = x_i + v \times t = 200 \text{ m} + (5.0 \text{ m/s} \times 100 \text{ s}) = 200 + 500 = \textbf{700 m}$.





Q11. Object 1 moves from $x = 20$ m to 0 m over 6 s. Object 2 moves from $x = 0$ m to 20 m over 6 s. When and where do the two objects meet?

A. Time = 2.0 s, Position = 10.0 m

B. Time = 6.0 s, Position = 10.0 m

C. Time = 3.0 s, Position = 10.0 m

D. Time = 6.0 s, Position = 15.0 m

Detailed Solution & Scientific Reasoning:

Correct Answer: C. Time = 3.0 s, Position = 10.0 m

Detailed Calculation:

- Object 1 equation: $x_1(t) = 20 - (20/6)t$.
- Object 2 equation: $x_2(t) = (20/6)t$.
- Equating $x_1 = x_2$: $20 - (20/6)t = (20/6)t \Rightarrow (40/6)t = 20 \Rightarrow t = 3.0$ s.
- Position $x = (20/6) \times 3.0 = 10.0$ m.

Q12. For the graph in Q11 (Object 1 and Object 2), what is the distance between the two objects at $t = 4.0$ s?

A. 5.0 m

B. 6.7 m (≈ 5.0 m)

C. 15.0 m

D. 20.0 m

Detailed Solution & Scientific Reasoning:

Correct Answer: B. 6.7 m (closest option A. 5.0 m or B. 6.7 m)

Detailed Calculation:

At $t = 4.0$ s:

- $x_1(4s) = 20 - (20/6)(4) = 20 - 13.33 = 6.67$ m.
- $x_2(4s) = (20/6)(4) = 13.33$ m.
- Separation distance = $|13.33 - 6.67| = 6.67$ m ≈ 6.7 m.

Q13. Two curves C and D intersect on a position–time graph at $t = 10$ s. Which physical quantity is the same for both objects at $t = 10$ s?

A. Average velocity

B. Instantaneous velocity

C. Position

D. Displacement

Detailed Solution & Scientific Reasoning:

Correct Answer: C. Position

Scientific Reasoning:

An intersection point on a position–time graph means both objects occupy the **exact same position** at that specific moment in time (they meet).





Q14. A position–time graph shows two straight lines for Cars A and B starting near the origin. Line A is steeper than Line B. What can be concluded about their average velocities?

A. Car B's speed is greater than Car A's speed, in the same direction

B. Car A's speed is greater than Car B's speed, in the same direction

C. Equal in magnitude, opposite in direction

D. Equal in magnitude, same direction

Detailed Solution & Scientific Reasoning:

Correct Answer: B. Car A's speed is greater than Car B's speed, in the same direction

Scientific Reasoning:

Both lines have positive slopes (same direction). Line A has a steeper slope than Line B, meaning **Car A moves at a higher speed** than Car B.

Q15. Mariam starts at $x = 0$ m and moves North to 20 m. Hessa starts at $x = 16$ m and moves South to 8 m. They cross paths at $t = 6$ s, $x = 12$ m. (1) Where do they meet? (2) Compare average velocities. (3) Distance apart at $t = 4$ s?

Detailed Solution & Scientific Reasoning:

Detailed Answers:

1. **Meeting Point:** They meet at $x = 12.0$ m (at $t = 6.0$ s).

2. **Average Velocity Comparison:**

- **Mariam's Velocity:** Positive slope (heading North), $v_M = 20 \text{ m} / 10 \text{ s} = +2.0 \text{ m/s}$.
- **Hessa's Velocity:** Negative slope (heading South), $v_H = (8 - 16) / 10 = -0.8 \text{ m/s}$.
- **Magnitude:** Mariam is faster ($|2.0 \text{ m/s}| > |0.8 \text{ m/s}|$). **Direction:** Opposite directions.

3. **Distance at $t = 4.0$ s:**

- $x_{\text{Mariam}}(4\text{s}) = 2.0 \times 4 = 8.0 \text{ m}$.
- $x_{\text{Hessa}}(4\text{s}) = 16 - (0.8 \times 4) = 12.8 \text{ m}$.
- **Separation** = $|12.8 - 8.0| = 4.8 \text{ m}$.

Q16. A car starts at $x = 150$ m West (-150 m) and moves East at a constant rate, reaching $x = +150$ m East at $t = 30$ s. (a) Calculate average velocity at $t = 25$ s. (b) Find position at $t = 35$ s.

Detailed Solution & Scientific Reasoning:

Detailed Calculation:

(a) **Average Velocity:**

$$v = \Delta x / \Delta t = (+150 \text{ m} - (-150 \text{ m})) / 30 \text{ s} = 300 \text{ m} / 30 \text{ s} = +10.0 \text{ m/s East.}$$

(b) **Position at $t = 35$ s:**

$$x(35\text{s}) = x_i + v \times t = -150 \text{ m} + (10.0 \text{ m/s} \times 35 \text{ s}) = -150 + 350 = +200 \text{ m East.}$$





Q17. Mariam moves East from $x = 0$ to 6 m in 10 s , stays at 6 m from $t = 10$ to 25 s , moves to 12 m at $t = 40\text{ s}$, then moves West back to 2 m at $t = 50\text{ s}$. (1) Where did she stop? (2) Describe motion in first 10 s . (3) Interval moving West? (4) Average velocity?

Detailed Solution & Scientific Reasoning:

Detailed Answers:

1. **Positions Stopped:** Stopped at $x = 6.0\text{ m}$ (between $t = 10\text{ s}$ and 25 s , slope = 0).
2. **First 10 Seconds:** Moved East at a constant speed of $v = 6.0 / 10 = 0.60\text{ m/s}$.
3. **Interval Moving West:** Between $t = 40\text{ s}$ and $t = 50\text{ s}$ (negative slope from 12 m to 2 m).
4. **Overall Average Velocity:**

$$v_{\text{avg}} = \text{Total Displacement} / \text{Total Time} = (2.0\text{ m} - 0\text{ m}) / 50\text{ s} = +0.040\text{ m/s East.}$$

Q18. A toy car moves North from $x = 6\text{ m}$ to 0 m (Stage A), from 0 m to 2 m (Stage B), and 2 m to 5 m (Stage C). Complete: (1) Table of Speed & Direction. (2) Total distance. (3) Total displacement.

Detailed Solution & Scientific Reasoning:

Detailed Answers & Table:

1. Stage Descriptions:

- Stage A: Constant speed | Moving **South** (toward origin, negative slope).
- Stage B: Constant speed | Moving **North** (away from origin, positive slope).
- Stage C: Constant speed | Moving **North** (positive slope).

2. Total Distance Covered:

$$d = |0 - 6| + |2 - 0| + |5 - 2| = 6\text{ m} + 2\text{ m} + 3\text{ m} = 11.0\text{ m.}$$

3. Total Displacement:

$$\Delta x = x_{\text{final}} - x_{\text{initial}} = 5.0\text{ m} - 6.0\text{ m} = -1.0\text{ m South.}$$

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