

SECTION

9.2 Graphical representation of position as a function of time



Textbook, p. 208 and 209



LAB 20 Analyzing uniform rectilinear motion

Aim of the experiment

To produce then analyze uniform rectilinear motion.

Experimental protocol

Materials and Equipment (Adjusted)

Per group of two

- One spark (or inkjet) timer ✓
- One roll of recording tape ✓
- One low-friction car with track X
- Two C-clamps ONE
- One metre stick X
- One roll adhesive tape X
- One bumper X
- Electrical extension cords (optional) X

Lab work

Follow these steps.

- 1 If the frequency of the timer can be adjusted, set it to 60 Hz. Answer question 1 in the *Results* section.
- 2 Reproduce the set-up illustrated in Figure 1.
- 3 Insert the recording tape in the timer, allowing it to protrude slightly.
- 4 Attach the end of the recording tape to the cart with adhesive tape.
- 5 Start the timer and, simultaneously, give a light and very brief push to the cart, so as to set it in motion. Let the cart glide along the track.

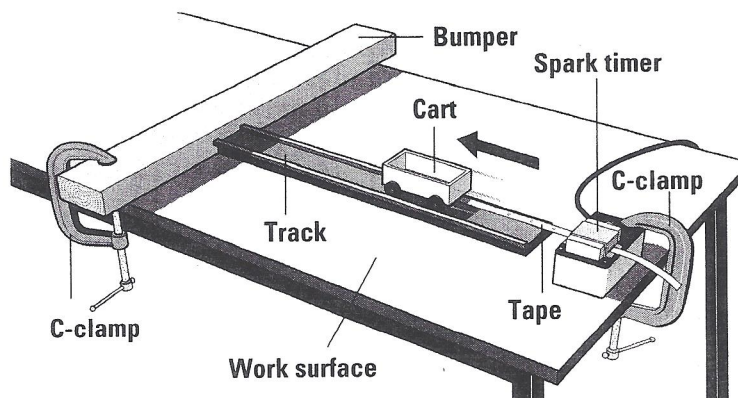


Figure 1 Set-up for producing and analyzing a uniform rectilinear motion

- 6 Stop the timer when the cart reaches the end of the track.
- 7 Remove the recording tape. Make sure that the points are easily visible on the tape. If they are not, see your teacher (or the lab technician) and repeat the experiment if necessary. Answer question 2 in the *Results* section.

- 8 Identify the point that corresponds approximately to the beginning of the uniform rectilinear motion, i.e. when the cart glides along the track without requiring a push. Circle the point and identify it as the point that corresponds to the time $t = 0.00$ s. We will assume that, at that moment, the cart was at position $x = 0.0$ cm. Complete the table in question 3 in the *Results* section.
- 9 Count three points from the mark corresponding to position $x = 0.0$ cm and identify the last of these three points as $t = 0.05$ s.
- 10 From this new mark, count another three points and identify the last of these three points as $t = 0.10$ s.
- 11 Continue to identify every third point on the recording tape up to 2.00 s.

Results

1. Given the timer's frequency, what is the time interval between two consecutive points on the recording tape?

Answer: _____

2. Examine the recording tape.

a) How can you recognize the part of the tape that corresponds to the moment when you pushed the cart?

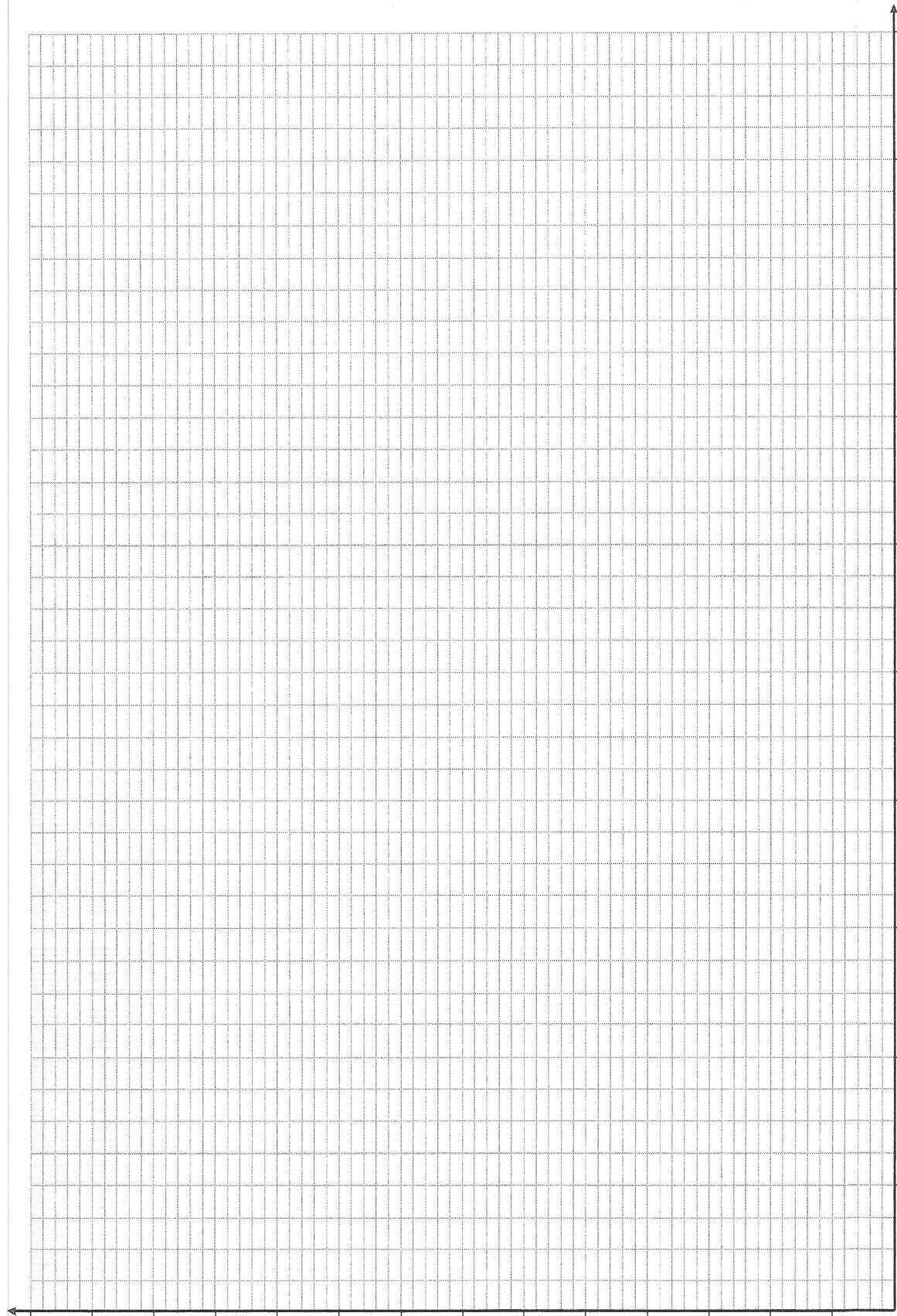
b) How can you recognize the location where the uniform rectilinear motion began?

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LAB 20 Worksheet

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6. a) Describe the curve in the graph drawn in question 5 and specify what relationship it represents.

- b) If applicable, identify the points that do not follow the graph's trend and attempt to explain their presence.

- c) Does the type of curve that you defined in a) correspond to the definition of uniform rectilinear motion? Explain any discrepancies.

7. a) Determine the cart's average velocity during the entire uniform rectilinear motion.

- b) Determine the cart's average velocity during the first half of its uniform rectilinear motion.

- c) Compare the values obtained in a) and in b).

8. What are the possible causes of error in this experiment?

Conclusion

9. Were you able to produce a uniform rectilinear motion? Explain your answer.
