B5 · Extra practice

Reading straight-line graphs | Diploma-style set of 8

Constants from the Alberta Physics 30 data sheets: $k = 8.99 \times 10^{9}$ N·m²/C², $e = 1.60 \times 10^{-19}$ C, electron mass $m_e = 9.11 \times 10^{-31}$ kg, proton mass $m_p = 1.67 \times 10^{-27}$ kg, $g = 9.81$ m/s².

Easy · B5-X01. A speed-time graph has a line of best fit through (1.0 s, 2.5 m/s) and (6.0 s, 14.0 m/s). The slope is the acceleration. Find the acceleration in m/s².

Response: _____

Easy · B5-X02. A line of best fit for distance against time is d = (12 m/s)t + 4 m. What does the 4 m stand for?

A. The distance at t = 0 s
B. The speed of the object
C. The slope of the line
D. The distance at t = 12 s

Response: _____

Medium · B5-X03. A graph of field strength E against $1/r^2$ for a point charge is a straight line through the origin. It passes through (4.00 m⁻², 216 N/C) and (25.0 m⁻², 1350 N/C). Use $k = 8.99 \times 10^{9}$ N·m²/C². Find the source charge in coulombs.

Response: _____

Medium · B5-X04. A cart starts from rest and speeds up steadily, so $d = \frac{1}{2}at^2$. Which pair of axes gives a straight line?

A. d on the vertical axis, t on the horizontal axis
B. t on the vertical axis, d on the horizontal axis
C. d on the vertical axis, t^2 on the horizontal axis
D. d on the vertical axis, $1/t^2$ on the horizontal axis

Response: _____

Medium · B5-X05. A spring test gives the line $F = (18.0\ \text{N/m})x + 0.40\ \text{N}$ for extensions from 0.020 m to 0.150 m. Find the extension x, in metres, that gives F = 2.50 N.

Response: _____

Challenging · B5-X06. A small charged ball sits in a uniform field. A graph of force F against test charge q is a straight line through the origin. It passes through (2.00×10^{-6} C, 3.00×10^{-3} N) and (8.00×10^{-6} C, 0.0120 N). Find the field strength in N/C.

Response: _____

Challenging · B5-X07. Force measurements were made for separations from 0.10 m to 0.50 m. A student predicts the force at 0.30 m and at 0.90 m from the line of best fit. Which statement is correct?

A. Both are interpolation, so both are equally reliable.

B. 0.30 m is extrapolation; 0.90 m is interpolation.

C. Both are extrapolation, so neither can be used.

D. 0.30 m is interpolation and is reliable; 0.90 m is extrapolation and is less reliable.

Response: _____

Challenging · B5-X08. A graph of force F against charge q gives the line $F = (1500\ \text{N/C})q + 2.0 \times 10^{-3}$ N. Theory says $F = qE$, so the line should pass through the origin. Give one likely reason for the 2.0×10^{-3} N and say what you would do about it.

Response: _____