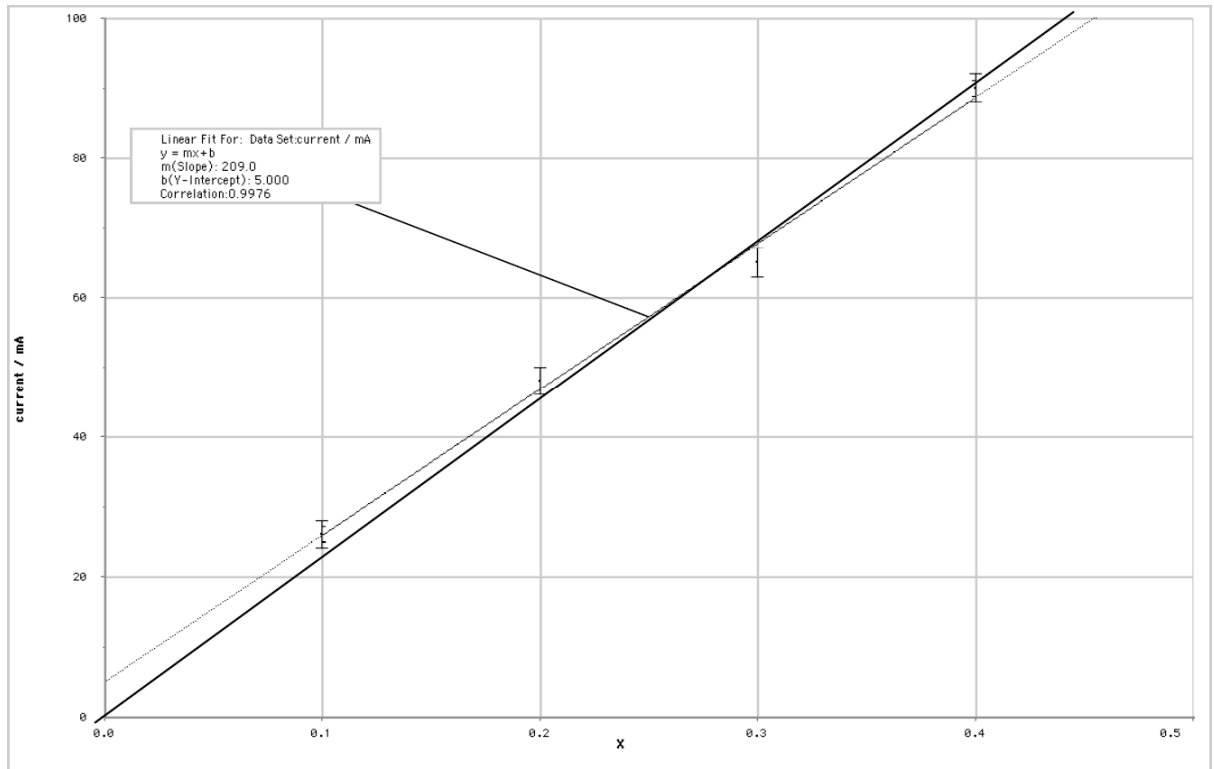


Answers to Coursebook questions – Chapter 1.2

1 No, since there appears to be a large systematic error, and a systematic error will not be reduced by repeated measurements.

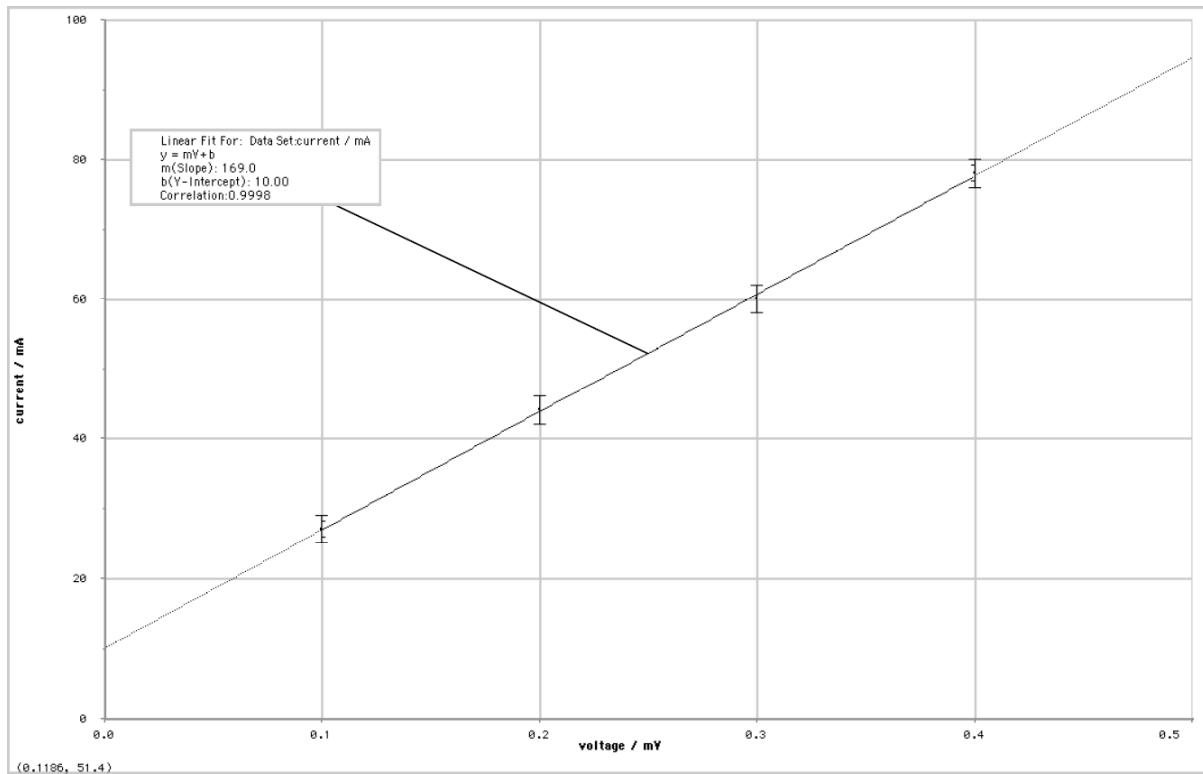
2 Systematic

3

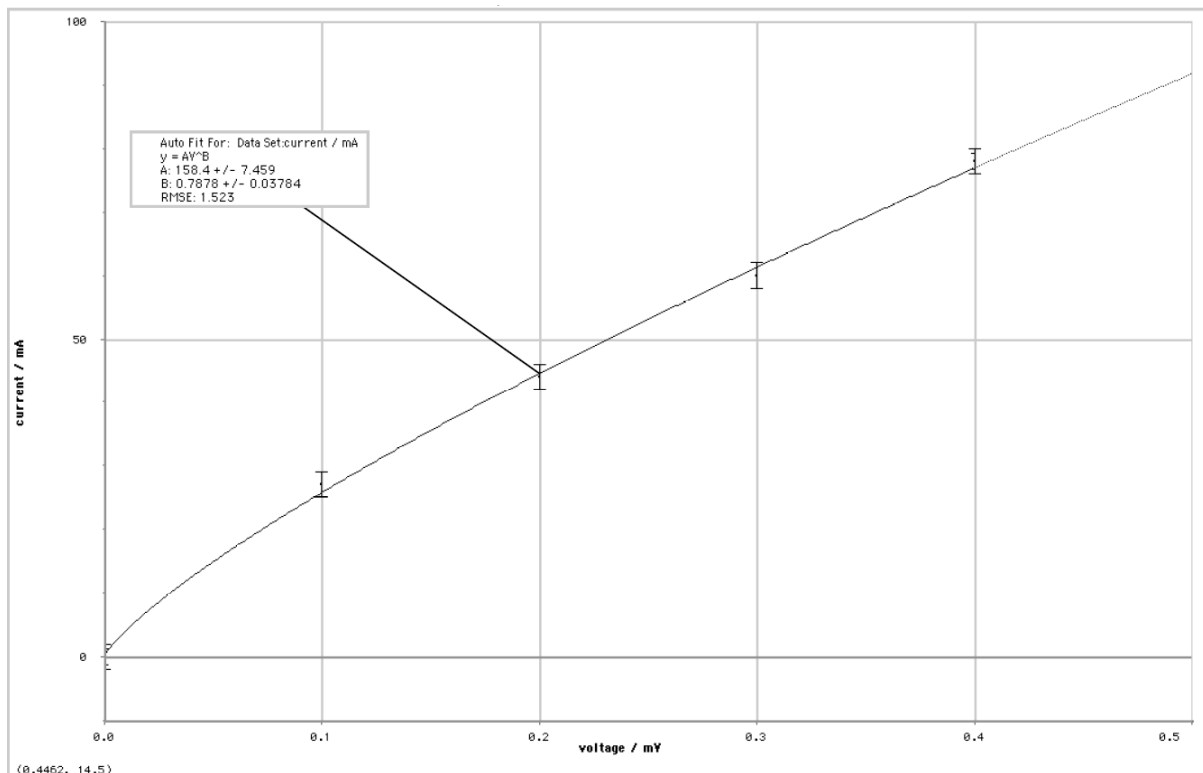


The line of best fit (grey line in the graph) does not go through the origin. There is a vertical intercept of 5 mA. However, an extreme line (black line) can be made to go through the origin and all the error bars.

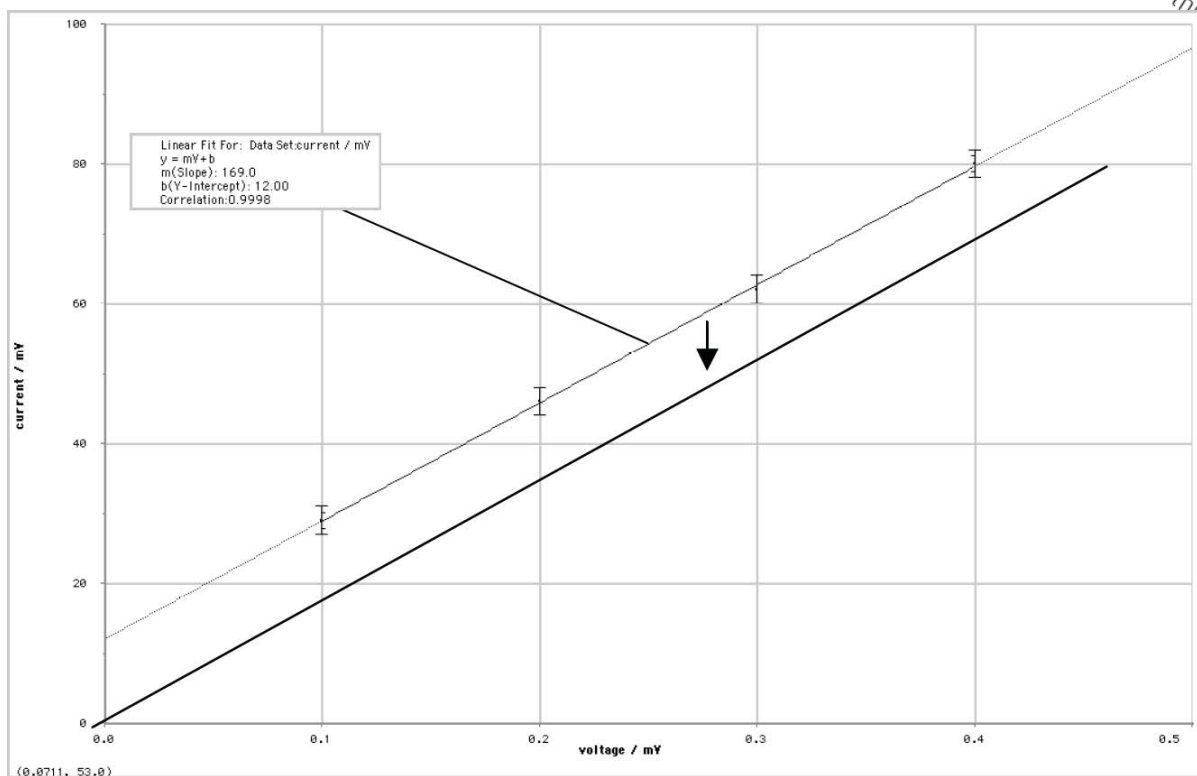
- 4 The vertical intercept is about 10 mA. No straight line can be made to pass through the origin and the error bars unless a systematic error of about 10 mA in the current is invoked.



However, a curved line of best fit can be fitted through the data that does go through the origin. However, it may be objected that this particular functional form is chosen – at low voltages we might expect a straight line (Ohm’s law). So a different functional form may have to be tried.

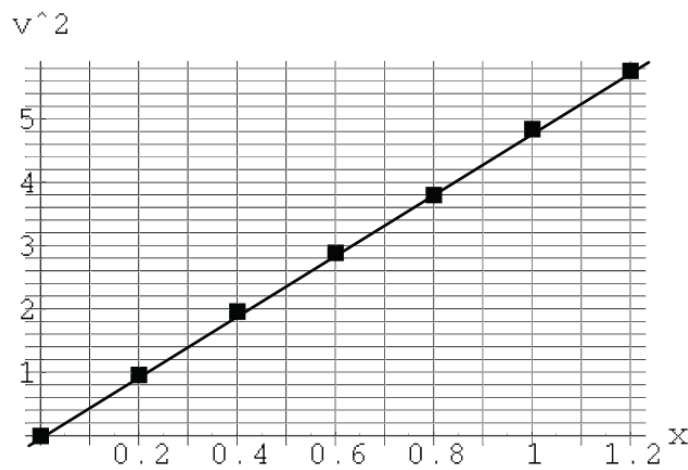


5



The straight line of best fit does not go through the origin. A large systematic error may be present.

6 Since we expect $v^2 = 2ax$ we use the given data to plot v^2 versus x . The data are read as (0.2, 0.98), (0.4, 1.40), (0.6, 1.70), (0.8, 1.95), (1.0, 2.20) and (1.2, 2.40). Hence we plot:



The slope is $2a$. Measuring the slope gives $2a = 4.8$, so $a = 2.4 \text{ m s}^{-2}$. Hence the equation is

$$v^2 = 2ax = 4.8x.$$

$$\text{When } x = 2.0 \text{ m, } v = \sqrt{4.8 \times 2.0} = \sqrt{9.6} = 3.1 \text{ m s}^{-1}$$