

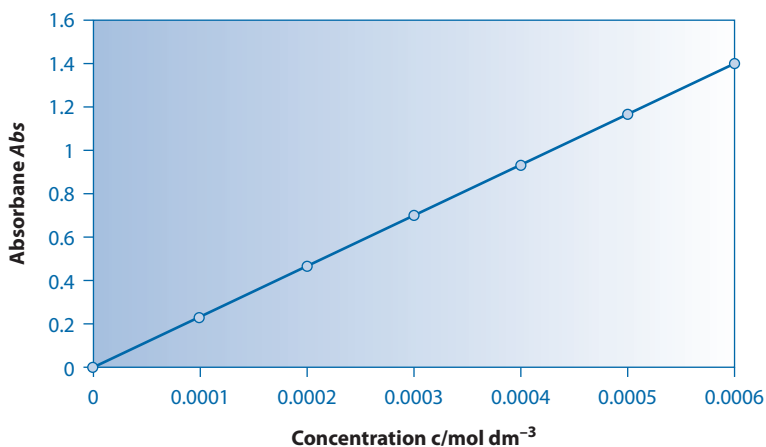
Graphs I

Pictorial representations of functions

27

Answers to additional problems

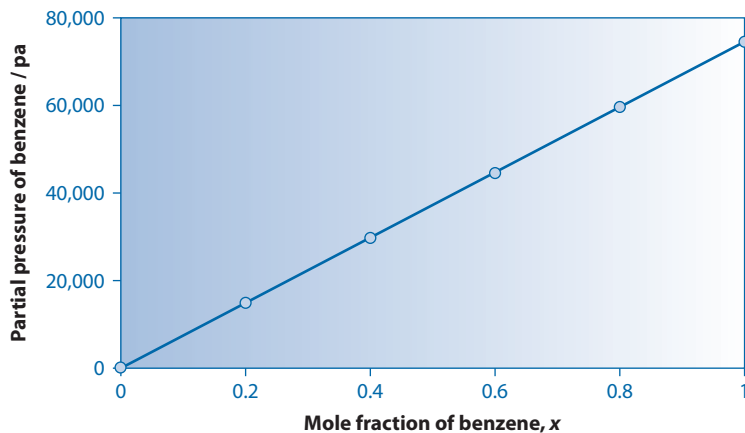
- 27.1 Qualitative, we have no idea of how many the 'more' here comprises.
27.2 Quantitative, we are given the exact numerical location of the peak.
27.3 Quantitative, we are given the exact duration of the lecture.
27.4 Qualitative, we do not know that duration of what 'longer' here implies.
27.5 Quantitative, we are given the exact number of people attending.
27.6



We plot the data. The equation of the line is $Abs = \epsilon c l$. The gradient of the line is ϵl and the constant is zero. That the line we plotted is linear suggests these data do indeed follow Beer's law.

- Notice the scope for error here: we cite concentration to 1 s.f. and absorbance to 5 s.f.

27.7



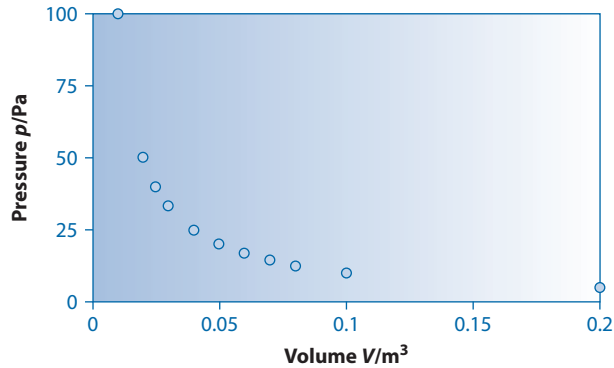
The linearity of the graph demonstrates that Raoult's law is obeyed.

$$\text{From Raoult's law, } p_{\text{benzene}} = p_{\text{benzene}}^{\ominus} \times x_{\text{benzene}}$$

The gradient of this graph will be $p_{\text{benzene}}^{\ominus} = 74.7 \text{ kPa}$.

- We need to exercise care with this problem because we use the same symbol x for mole fraction and for controlled variable.

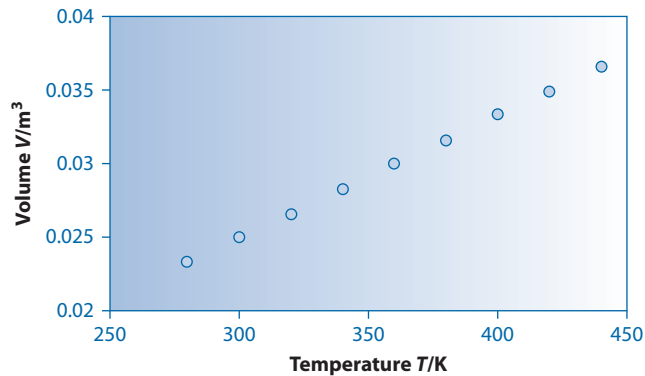
27.8 The graph shows a smooth curve which demonstrates a correlation of sorts. We do not know anything else about the relationship between V and p because the graph is not linear.



27.8 The actual equation of this line is,

$$V = \frac{nR}{p} \times T$$

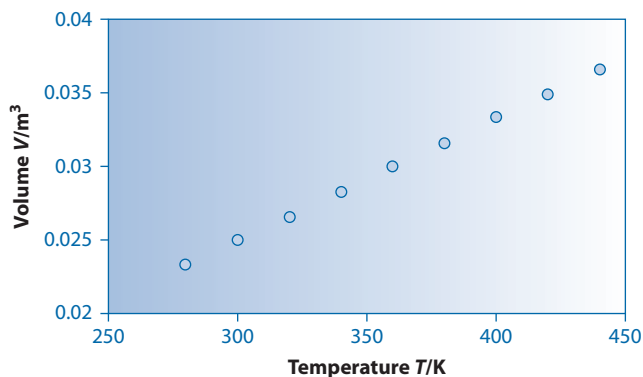
the gradient is (nR/p) , and the intercept is zero. That the line we plotted is linear suggests these data do indeed follow the ideal-gas equation.



27.9 The actual equation of this line is,

$$V = \frac{nR}{p} \times T$$

the gradient is (nR/p) , and the intercept is zero. That the line we plotted is linear suggests these data do indeed follow the ideal-gas equation.



- 27.10** Before plotting, we add an extra, third line in the table to include $1/[A]$. Then calculate the values from $[A]$ rather than measure them.

Time t /seconds	0	600	1200	1800	2400
$[A]$ /mol dm ⁻³	0.400	0.350	0.311	0.279	0.254
$[A]^{-1}$ /(mol dm ⁻³) ⁻¹	2.5	2.857	3.215	3.584	3.937

If the reaction is second order, the equation relating the concentration of $[A]$ and time, is,

$$\frac{1}{[A]_t} = kt + \frac{1}{[A]_0}$$

That the line we plotted is linear suggests this reaction does indeed follow a second-order rate law. Comparing this equation with the equation for a straight line says the line's gradient is the second-order rate constant k and the intercept is $1/[A]_0$.

