Tutorial Topic 4 : Kinetic theory of gasses

October/November 2003

1 **(a)** State **two** assumptions of ideal gas behaviour.

(i) .....

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(ii) .....

.....[2]

Use of the *Data Booklet* is relevant in (b) and (c).

(b) The ideal gas equation is $pV = nRT$. Explain as fully as you can the meaning of the following terms, and give the units for each to correspond with the value of R given in the *Data Booklet*.

(i) p .....

.....

(ii) V .....

.....

(iii) T .....

.....[6]

(c) **(i)** When an evacuated glass bulb of volume 63.8 cm^3 is filled with a gas at 24 °C and 99.5 kPa, the mass increases by 0.103 g. Deduce whether the gas is ammonia, nitrogen or argon.

(ii) Explain why ammonia is the most likely of these three gases to deviate from ideal gas behaviour.

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.....[5]

1. A 2.0 dm^3 flask contains 0.2 mole of N_2 and 0.4 mole of O_2 at 400K. Calculate

(a) the partial pressure of N_2

(b) the partial pressure of O_2

(c) the total pressure in the flask.

2. In an experiment, 0.300 g of a vapourised liquid was found to have a volume of 84.0 cm^3 at 97°C and at a pressure of 105 kPa. Calculate the relative molecular mass of the vapour.

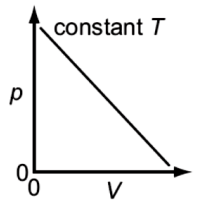
3. A gas has a density of 1.70 g dm^{-3} at 127°C and at a pressure of 200 kPa. Calculate the relative molecular mass of the gas.

4. 0.400 g of a gas has a volume of 227 cm^3 at 27°C and at a pressure of 100 kPa. Calculate the relative molecular mass of the gas.

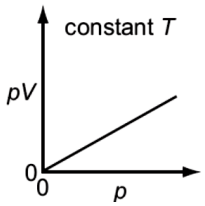
May/ June 2008

8 Which diagram correctly describes the behaviour of a fixed mass of an ideal gas? (*T* is measured in K.)

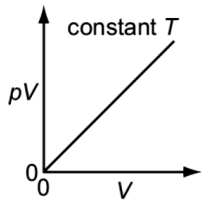
A



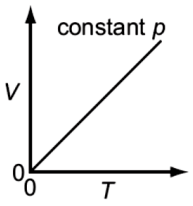
B



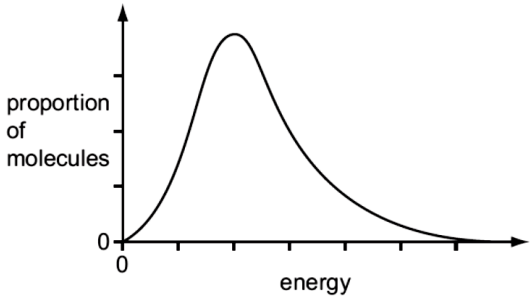
C



D

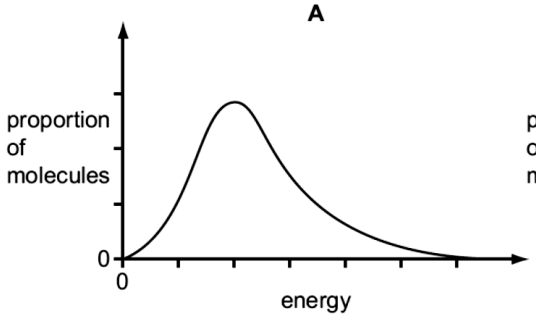


12 The molecular energy distribution curve represents the variation in energy of the molecules of a gas at room temperature.

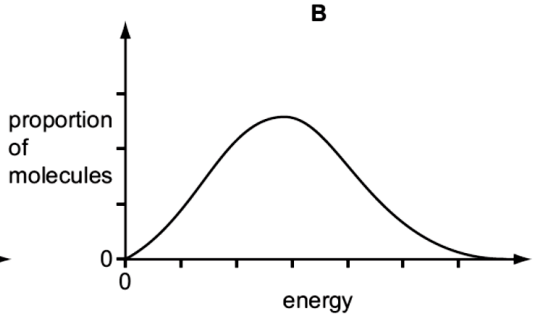


Which curve applies for the same gas at a lower temperature?

A



B



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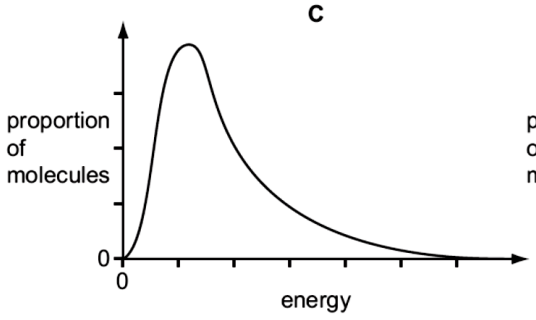
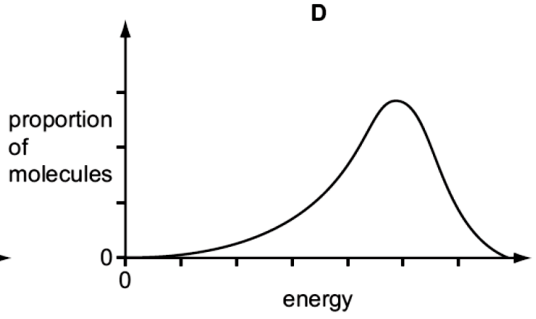


D



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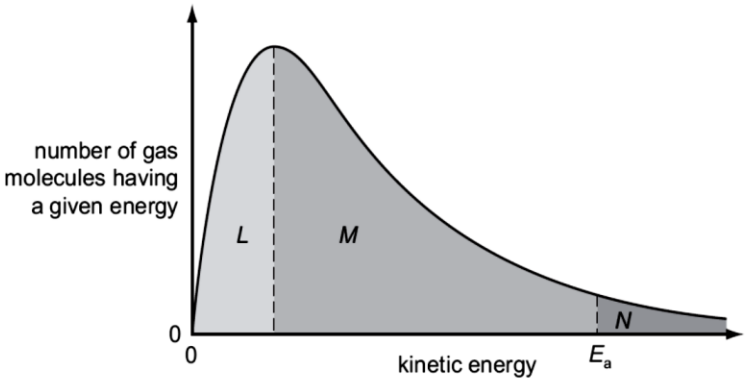
10 The Boltzmann distribution shows the number of molecules having a particular kinetic energy at constant temperature.



If the temperature is decreased by 10 °C, what happens to the size of the areas labelled *L*, *M* and *N*?

	L	*M*	*N*
A	decreases	decreases	decreases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	decreases	increases

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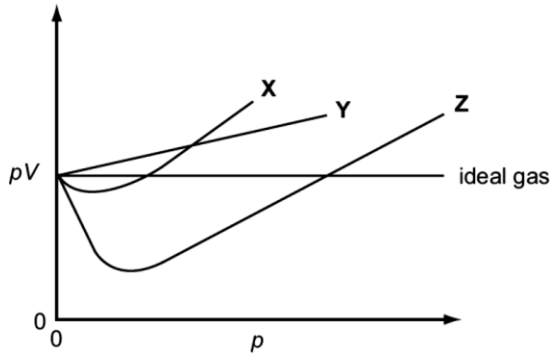
6 For an ideal gas, the plot of pV against p is a straight line. For a real gas, such a plot shows a deviation from ideal behaviour. The plots of pV against p for three real gases are shown below.

The gases represented are ammonia, hydrogen and nitrogen.



What are the identities of the gases **X**, **Y** and **Z**?

	X	**Y**	**Z**
A	ammonia	nitrogen	hydrogen
B	hydrogen	nitrogen	ammonia
C	nitrogen	ammonia	hydrogen
D	nitrogen	hydrogen	ammonia