

12) Given  $E_a = 31.05 \times 10^{-21} \text{ J}$

For  $T = 300 \text{ K}$   $\langle K_{tr} \rangle = \frac{3}{2} (1.381 \times 10^{-23} \text{ J/K}) \times 300 \text{ K}$   
 $= 6.2145 \times 10^{-21} \text{ J}$

$\frac{E_a}{\langle K_{300} \rangle} = \frac{31.05}{6.2145} = 5$

For  $T = 375 \text{ K}$   $\langle K_{tr} \rangle = \frac{3}{2} (1.381 \times 10^{-23} \text{ J/K}) \times 375 \text{ K}$   
 $= 7.7681 \times 10^{-21} \text{ J}$

$\frac{E_a}{\langle K_{375} \rangle} = \frac{31.05}{7.7681} = 4$

$E_a = 5 \langle K_{300} \rangle = 4 \langle K_{375} \rangle$

From table on formula sheet

Fraction of molecules with energies  $> E_a = 5 \langle K_{tr} \rangle$  is 0.0018

" " " "  $> E_a = 4 \langle K_{tr} \rangle$  is 0.0076

$\frac{0.0076}{0.0018} = 4.2$

So there are 4.2 times as many molecules with the necessary  $E_a$  at 375K as there are at 300K (A)