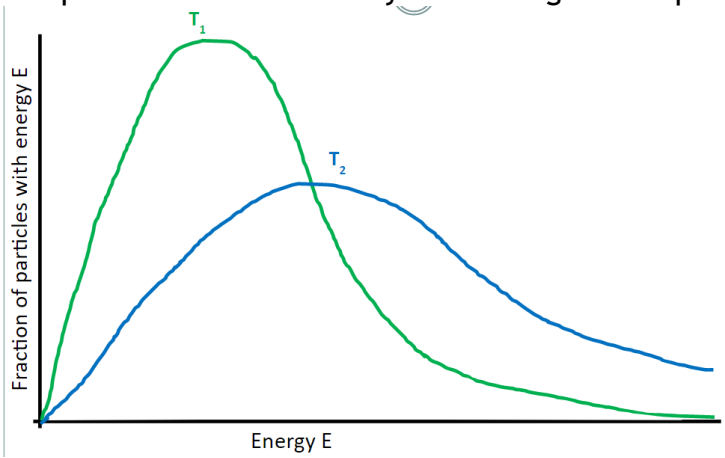
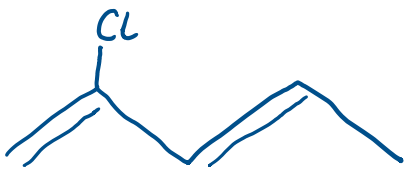
Retrieval Practice: Year 13 Number 19

Rules: Never look at your notes for retrieval practice! Do as many as you can, even if they are educated guesses. When you have tried (hard!) to answer them all, check the mark scheme and rate each question:

- Easy, remembered perfectly
- Harder – could remember part of it or was familiar when I saw the answer
- Very hard – didn't recognise the answer so need to go back over this

	Question	Rating
1	Give the units of the rate constant for this reaction: Rate = $k[A][B]^2$	
2	Write a balanced equation for the reaction between nitric acid and barium hydroxide (state symbols not required)	
3	Draw a Maxwell-Boltzmann distribution curve for a system at a particular temperature, then draw a second curve to show the particles in the same system at higher temperature.	
4	Calculate the volume, in cm^3, of 140 grams of nitrogen gas at 200 kPa and 35°C ($R = 8.31\ Jmol^{-1}K^{-1}$)	
5	Name the shape and give the bond angle for a molecule of phosphine, PH_3. Explain, using electron repulsion theory, why it has this shape.	
6	Draw the skeletal formula of 2-chloro pent-1,3-diene	
7	Calculate the C-Cl bond enthalpy in chloromethane given the following information and bond enthalpy values: $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$ $\quad \Delta H = -101$ kJmol-1 C-H = 436 $kJmol^{-1}$, Cl-Cl = 243 $kJmol^{-1}$, H-Cl = 432 $kJmol^{-1}$	
8	Write an equation, including state symbols, to represent the lattice formation enthalpy of magnesium iodide	
9	Describe how you could use recrystallisation to purify a solid organic compound	
10	Use the equation and data provided to calculate K_c for the following system: $4HCl(g) + O_2(g) \rightarrow 2Cl_2(g) + 2H_2O(g)$ 0.800 mol of hydrogen chloride was mixed with 0.200 mol of oxygen in a vessel of volume 10 dm^3. At equilibrium it was found that the mixture contained 0.200 mol of hydrogen chloride.	

Answers:

	Question	Rating
1	Give the units of the rate constant for this reaction: Rate = $k[A][B]^2$ *$mol^{-2}\ dm^6\ s^{-1}$*	
2	Write a balanced equation for the reaction between nitric acid and barium hydroxide (state symbols not required) *$Ba(OH)_2 + 2HNO_3 \rightarrow Ba(NO_3)_2 + 2H_2O$*	
3	Draw a Maxwell-Boltzmann distribution curve for a system at a particular temperature, then draw a second curve to show the particles in the same system at higher temperature 	
4	Calculate the volume, in cm^3, of 140 grams of nitrogen gas at 200 kPa and 35°C (R = 8.31 $Jmol^{-1}K^{-1}$) *Moles = 140/28* = 5* **Be careful - the formula of nitrogen is N_2!* *PV = nRT so V = nRT/P* *V (in m^3) = 5 x 8.31 x (273+35) / 200 000* *V = 0.0640 m^3* *V in cm3 = 0.0640 x 1000000 = 63400 cm^3*	
5	Name the shape and give the bond angle for a molecule of phosphine, PH_3. Explain, using electron repulsion theory, why it has this shape. *(Trigonal) pyramidal; 107°* *There are four areas of electron density; 3 bonds and one lone pair. Electrons repel and so will move apart to minimise repulsion. The furthest distance apart will be 109.5°, however the lone pair repels more than the bonded pairs so the bond angle is reduced to 107°.*	
6	Draw the skeletal formula of 2-chloro pent-1,3-diene 	

7	Calculate the C-Cl bond enthalpy in chloromethane given the following information and bond enthalpy values: $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$ $\Delta H = -101$ kJmol-1 C-H = 436 kJmol^{-1}, Cl-Cl = 243 kJmol^{-1}, H-Cl = 432 kJmol^{-1} *(4x436 + 243) - (3x436 + C-Cl + 432) = -101* *C-Cl = 348 kJmol^{-1}*	☺ 😕 ☹
8	Write an equation, including state symbols, to represent the lattice formation enthalpy of magnesium iodide $Mg^{2+}(g) + 2Cl^-(g) \rightarrow MgCl_2(s)$	☺ 😕 ☹
9	Describe how you could use recrystallisation to purify a solid organic compound • *Dissolve solid in the minimum amount of hot solvent* • *Filter while hot (to remove insoluble impurities)* • *Allow to cool (on ice) and form crystals* • *Filter off crystals (to remove soluble impurities) and wash with cold solvent* • *leave crystals to dry*	☺ 😕 ☹
10	Use the equation and data provided to calculate K_c for the following system: $4HCl(g) + O_2(g) \rightarrow 2Cl_2(g) + 2H_2O(g)$ 0.800 mol of hydrogen chloride was mixed with 0.200 mol of oxygen in a vessel of volume 10 dm^3. At equilibrium it was found that the mixture contained 0.200 mol of hydrogen chloride. $4HCl(g) + O_2(g) \rightarrow 2Cl_2(g) + 2H_2O(g)$ Initial mol 0.800 0.200 0 0 Change -0.6 -0.15 +0.3 +0.3 Eqm mol 0.200 0.050 0.300 0.300 Eqm conc 0.02 0.005 0.03 0.03 $K_c = (0.03^2 \times 0.03^2) / (0.02^4 \times 0.005) = 1013$ mol^{-1}dm^3	☺ 😕 ☹