CAMBRIDGE
International Examinations

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Getting started – Pre-U Chemistry 9791

Proposed course schedule

The schedule below gives a potential course for the day. Individual sessions may be substituted according to the wishes/needs of participants; timings may also change according to demand.

Please be prepared to state what experience you have of teaching, and of delivering Pre-U Chemistry. Are there areas in particular you would like this course to cover?

1000 Arrive & refreshments

1030 Introduction: general notices & overview of course

1050 Getting to know Pre-U Chemistry: structure of 9791, how it is examined, grading

1130 Looking further: distinctive approaches
Van Arkel, Functional Group Level, Orbitals, other distinctive topics

1215 Teaching strategies
Lesson planning; discussion of different methods with regard to the syllabus

1300 Lunch

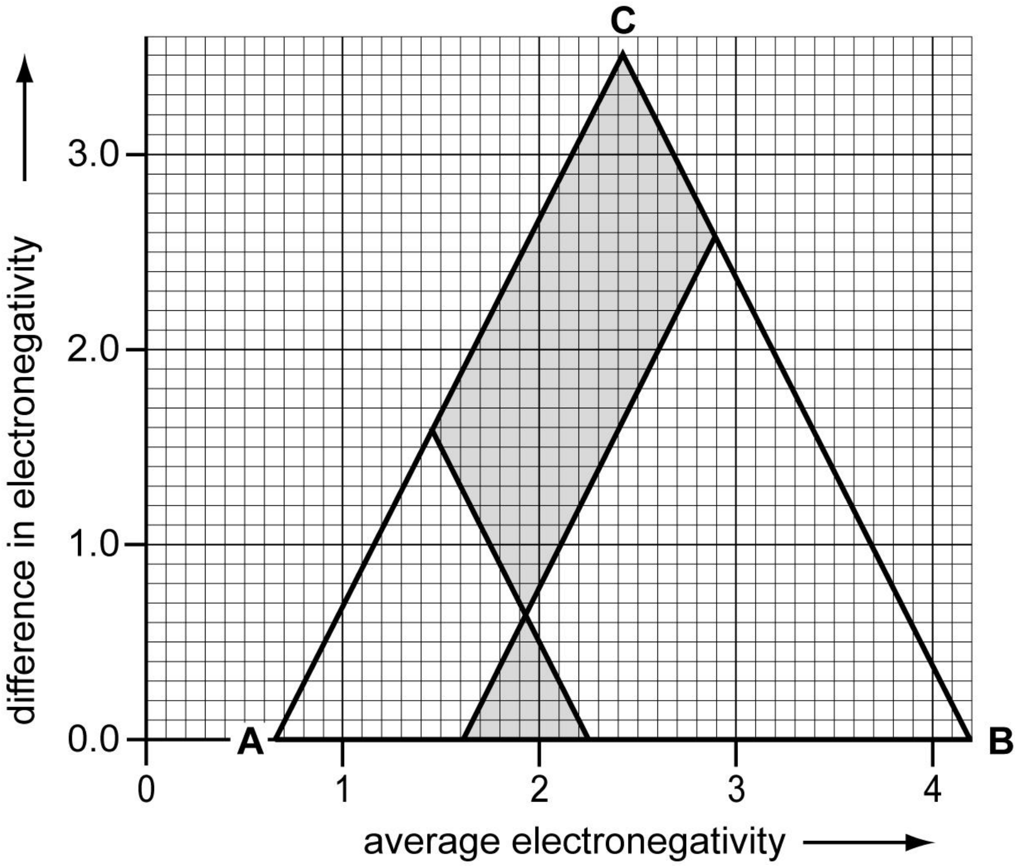
1350 Updates to specification for first examination 2016
Review of new specimen papers

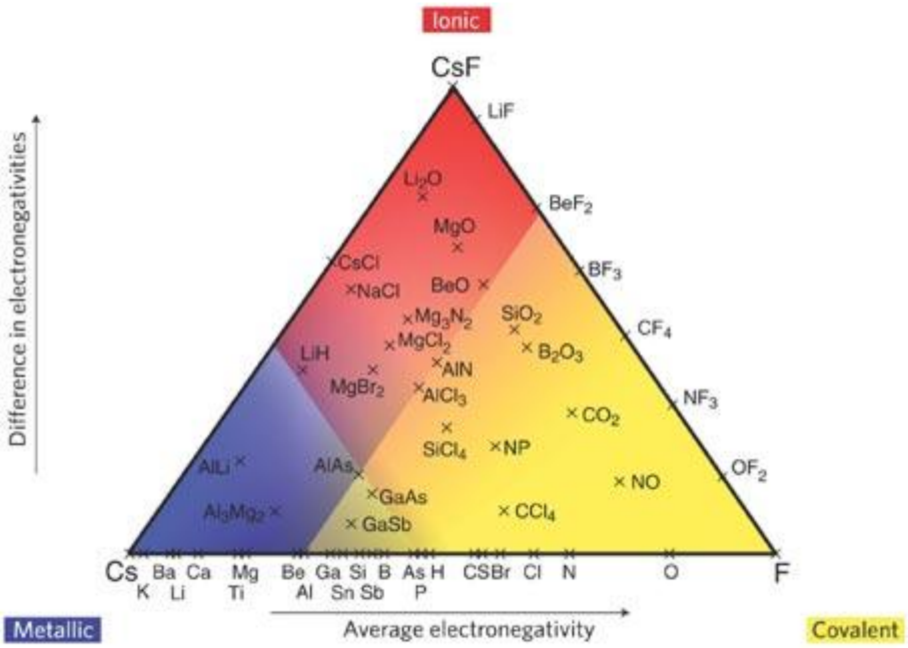
1430 Formative & summative assessment; marking exercise
Practical work

1530 Planning to deliver the overall Pre-U course
Schemes of work, question papers & mark schemes, further (online) resources

1610 Wrap-up & further questions
Depart

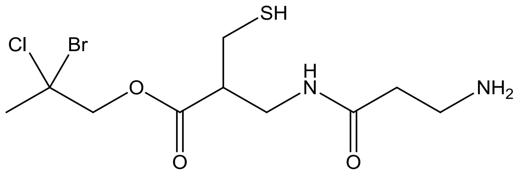
Van Arkel diagrams





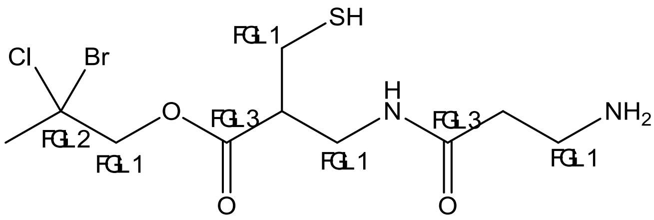
Functional Group Level

e.g.



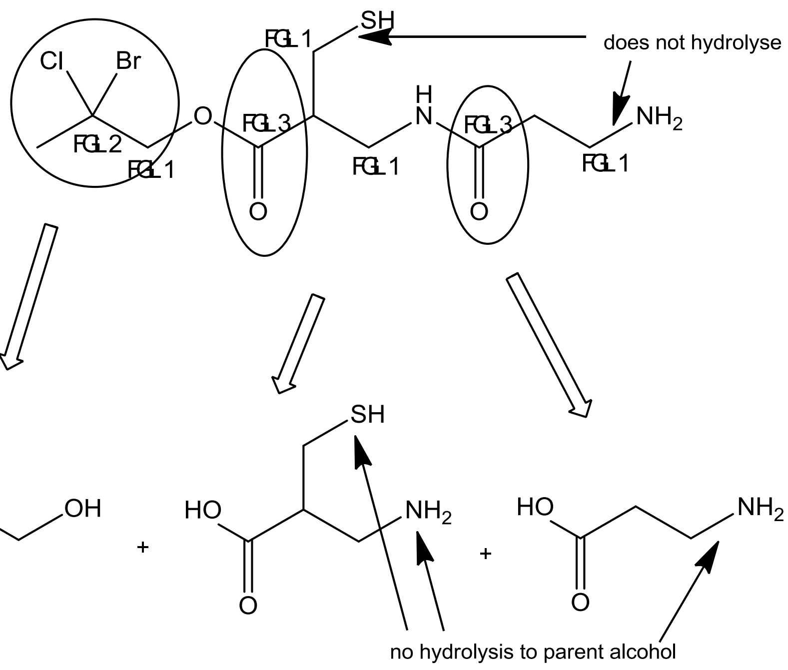
We initially consider hydrolysis in neutral conditions.

1. Find all carbon atoms with hetero atoms attached and assign FGLs.



2. Hydrolyse the molecule by drawing the parent functional groups. Note that **only** FGL 1 chlorides, bromides and iodides hydrolyse.

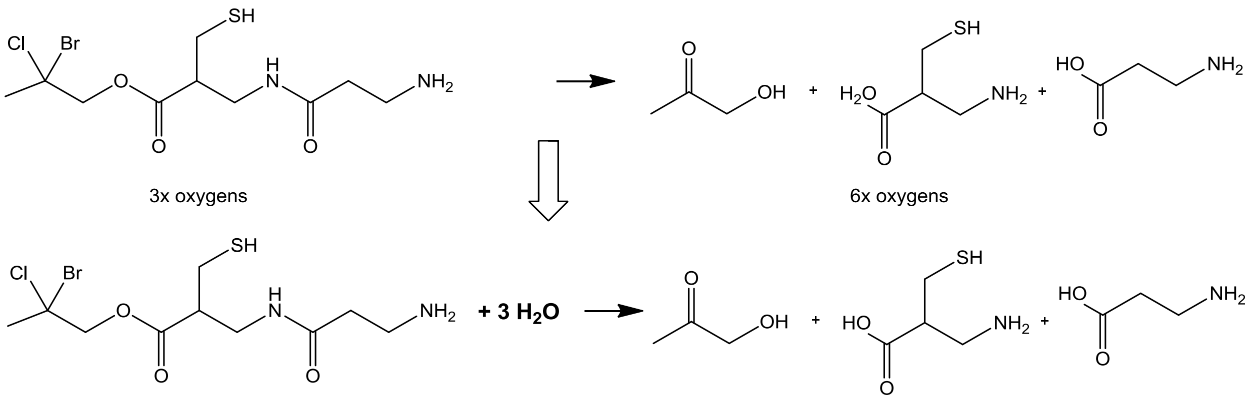
   (N.B. secondary amides, *i.e.* FGL 3 carbons connected to N do hydrolyse, but only to the amine and carboxylic acid, primary amines or thiols do not hydrolyse).



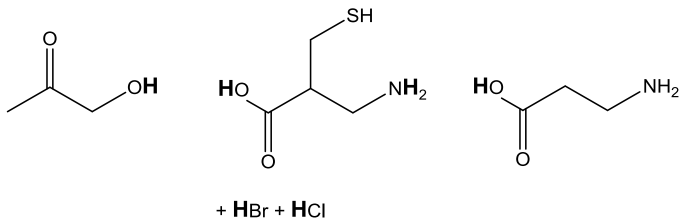
3. Add one hydrogen to each heteroatom for each bond broken.

   e.g. **C-Br**: add 1x H to Br → HBr **C=S**: add 2x H to S → H_2S etc.

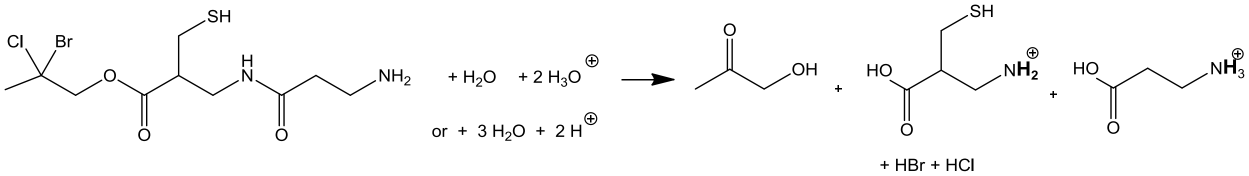
4. Balance the oxygens by adding water on the left hand side of the equation.



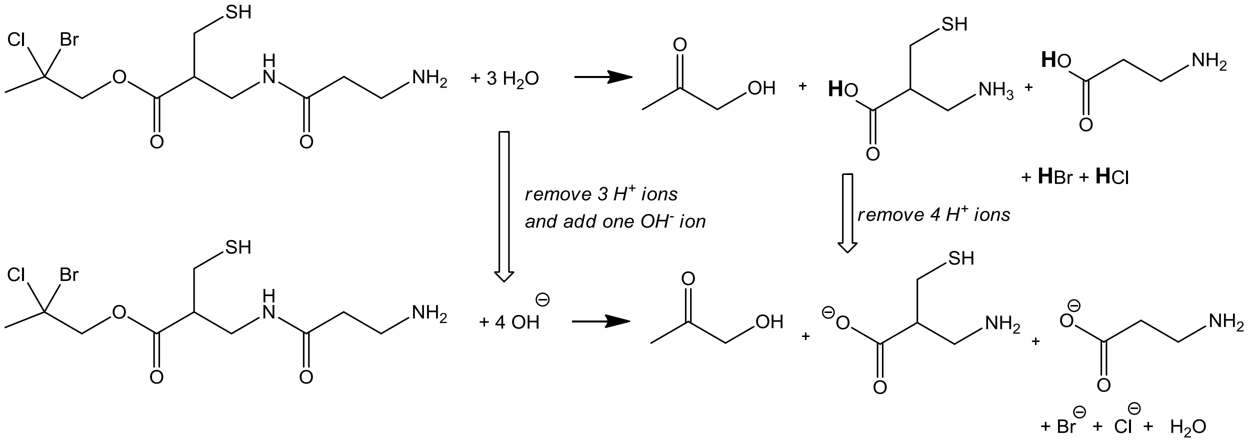
5. Hydrogen should now also balance. In the above example we introduced 8 new hydrogens which squares with the 8 hydrogens that come from the water.



6. (a) For <u>acid hydrolysis</u>:
   1. Amino groups will be protonated to form the ammonium ion.
   2. Add H^+ ions to the water on the left hand side of the equation to balance the charges.



(b) <u>For alkaline hydrolysis</u>: any carboxylic acid will form the carboxylate ion and the inorganic molecules form their conjugate bases.
   1. Remove an H^+ ion from each acid group
   2. Take away the same number of H^+ ions from the water molecules on the left hand side leaving you with OH^- ions.
   3. Now balance for charges by adding more OH^- ions if needed.
   4. Balance for oxygens by adding water.



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Practical assessment

What practicals should be done, as they are likely to come up in Paper 4 (Practical Paper)?

- Heating to constant mass.
- Preparing a standard solution, usually followed by…
- Titration
  - Acid/base
  - Thermometric (appeared in Specimen paper)
  - Redox
- ΔH_{neut} type questions – measuring temperature change.
- Qualitative tests using the data sheet.
- Organic qualitative tests (Tollen's, $H^+/K_2Cr_2O_7$, $H^+/KMnO_4$, $NaHCO_3$, $H^+/AgNO_3$ (appeared in a planning question), Br_2 (aq) (mentioned in syllabus appendix).
- Clock reaction (appeared in Interim paper).

Other likely practicals that may come up?

- Cooling curve
- Diprotic acid titration
- Any other suggestions…?

Practicals that they should do in order to be familiar with as they may come up in Paper 2 planning question, but that aren't likely to come up in practice.

- Organic – distillation, heating under reflux, recrystallisation, melting point analysis.
- Separation techniques.