Subject	Year	Term
Chemistry	13	1 and 2

Topic

6.3.2 Spectroscopy

Content (Intent)

Prior Learning (Topic) 2.1, Atoms and reactions (especially 2.1.3), 4.1.1 Basic concepts, 4.2.4 Analytical techniques

NMR Spectroscopy

(a) analysis of a carbon-13 NMR spectrum of an organic molecule to make predictions about:
(i) the number of carbon environments in the molecule
(ii) the different types of carbon environment present, from chemical shift values
(iii) possible structures for the molecule

(b) analysis of a high resolution proton NMR spectrum of an organic molecule to make predictions about:
(i) the number of proton environments in the molecule
(ii) the different types of proton environment present, from chemical shift values
(iii) the relative numbers of each type of proton present from relative peak areas, using integration traces or ratio numbers, when required
(iv) the number of non-equivalent protons adjacent to a given proton from the spin– spin splitting pattern, using the $n + 1$ rule
(v) possible structures for the molecule

(c) prediction of a carbon-13 or proton NMR spectrum for a given molecule

(d) (i) the use of tetramethylsilane, TMS, as the standard for chemical shift measurements
(ii) the need for deuterated solvents, e.g. $CDCl_3$, when running an NMR spectrum
(iii) the identification of O–H and N–H protons by proton exchange using D_2O

Combined techniques

(e) deduction of the structures of organic compounds from different analytical data including:
(i) elemental analysis **(see also 2.1.3 c)**
(ii) mass spectra **(see also 4.2.4 f–g)**
(iii) IR spectra **(see also 4.2.4 d–e)**
(iv) NMR spectra.

Future Learning (Topic) 5.1.1 How fast

How will knowledge and skills be taught? (Implementation)	How will your understanding be assessed & recorded (Impact)
Written Presentations Past paper question examples and answers Modelled answers with key points/terms Explanation of NMR peaks. Sketching NMR spectra Roleplaying NMR spectra	- 2 x standard homeworks (Grades given. Written feedback. Response expected.) -1 x Paper 2 (Grade given. Verbal feedback to class and individuals.)

How can parents help at home?

Look at the topic specific resources on the VLE
Use appropriate websites: MachemGuy, Allery Chemistry, Chemistry World – by Royal Society of Chemistry, ChemGuide.

Take an interest! Ask your children what they have learnt and be curious about their learning.

Helpful further reading/discussion

Reading	**Vocabulary Lists**	**Careers Links**
Text book: A level chemistry for OCR by Rob Ritchie and Dave Gent. Chapter 29 p.512-537 The Science of Everyday Life by Marty Jopson Why Chemical Reactions Happen by Keeler and Wothers	carbon environment proton environment chemical shift adjacent non-equivalent protons spin– spin splitting pattern singlet doublet triplet quartet tetramethylsilane deuterated solvent	Medicine Veterinary science Material science Biomedical sciences Environmental science Toxicologist Pharmacist Dentist Patent law Forensic science