6.3 Analysis
6.3.1 Chromatography and qualitative analysis

Types of chromatography				
(a) interpretation of one-way TLC chromatograms in terms of Rf values				

(b) interpretation of gas chromatograms in terms of:
    (i) retention times
    (ii) the amounts and proportions of the components in a mixture.				

Tests for organic functional groups				
(c) qualitative analysis of organic functional groups on a test-tube scale; processes and techniques needed to identify the following functional groups in an unknown compound: (i) alkenes by reaction with bromine (ii) haloalkanes by reaction with aqueous silver nitrate in ethanol (i) phenols by weak acidity but no reaction with CO_3^{2-} (ii) carbonyl compounds by reaction with 2,4- DNP (iii) aldehydes by reaction with Tollens' reagent (iv) primary and secondary alcohols and aldehydes by reaction with acidified dichromate (v) carboxylic acids by reaction with CO_3^{2-}				

6.3.2 Spectroscopy

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   (ii) mass spectra
    (iii) IR spectra (iv) NMR spectra.				