## Map of the unit: Medicines by Design

This shows the relationship between the Storyline, the Activities and the Chemical Ideas. To aid planning, laboratory-based practical work is indicated by (P), activities involving IT skills are indicated by (IT) and those developing study skills by (S).

ACTIVITIES	CHEMICAL STORYLINE	CHEMICAL IDEAS
MD1.1 Aldehydes and ketones (P) MD1.2 BAC determination using gas–liquid chromatography	MD1 ALCOHOL IN THE BODY	NoteIt is intended that the study of these Chemical Ideas should run in parallel with the Storyline throughout this unit.13.7Aldehydes and ketones14.1Planning a synthesis14.2Summary of organic reactions7.6Chromatography (revision)6.4Infrared spectroscopy (revision)
	MD2 THE DRUG ACTION OF ETHANOL	13.9 Amino acids (revision)
<ul> <li>MD3.1 Making a toolkit of organic reactions</li> <li>MD3.2 Classifying reactions</li> <li>MD3.3 Using the toolkit to synthesise medicines</li> <li>MD3.4 Manufacturing salbutamol (optional extension)</li> </ul>	MD3 MEDICINES THAT SEND MESSAGES TO NERVES	<ul> <li>6.5 Mass spectrometry (revision)</li> <li>6.6 Nuclear magnetic resonance spectroscopy (revision)</li> <li>6.8 Ultraviolet and visible spectroscopy (revision)</li> </ul>
	MD4 ENZYME INHIBITORS AS MEDICINES	
<ul><li>MD5.1 Making and testing a penicillin (P)</li><li>MD5.2 A closer look at the structure of penicillins (optional extension)</li></ul>	MD5 TARGETING BACTERIA	
MD6 Check your notes on Medicines by Design (S)	MD6 SUMMARY	

**Note** Chemical Ideas in italics are revisited from earlier units.

A2

LEVEL

# MEDICINES BY DESIGN

## Relation to other units

We suggest that this teaching unit comes last in the course. It provides a good summary and revision of the organic chemistry which students have been learning throughout the course, particularly in **Developing Fuels**, **The Atmosphere**, **The Polymer Revolution**, **What's in a Medicine?**, **Designer Polymers**, **Engineering Proteins** and **Colour by Design**. Spectroscopic techniques, first met in **What's in a Medicine?**, **Engineering Proteins** and **Colour by Design**, are used to determine the structure of organic compounds.

The unit also makes use of ideas about isomerism, molecular shape and molecular recognition which have been introduced in **Engineering Proteins**. There is also another application of gas–liquid chromatography, a technique which has been met previously in **Colour by Design**.

Students should find this a highly motivating unit and we hope that, even though placed last, it will be given sufficient time and proper emphasis in the A-level course.

#### Concept map

The concept map which follows shows how the major chemical ideas in this teaching unit develop throughout the course

Concept	Introduced in unit	Developed in unit(s)	Assumed in unit(s)
Organic functional groups	DF	A, PR, WM, DP, EP, CD	AA, MD
Alcohols	DF	PR, WM, DP, MD	CD
Aldehydes and ketones	WM	MD	_
Carboxylic acids	WM	DP	EP, AA, CD, MD
Amines and amides	DP	EP	CD, MD
Amino acids	EL	EP	MD
Proteins and enzymes	EL	EP	MD
Isomerism	DF	PR, EP	SS, AA, MD
Shapes of molecules	EL	DF, PR, EP, MD	A, WM, DP, SS, AA, CD, O
Molecular recognition	EP	MD	-
Chromatography	WM	CD	EP, AA, MD
Reaction mechanisms	Α	PR, CD, MD	-
Condensation reactions	DP	EP	MD
Elimination reactions	WM	-	MD
Mass spectrometry	EL	WM	MD
Infrared spectroscopy	WM	-	CD, MD
Nuclear magnetic resonance spectroscopy	EP	_	MD
Ultraviolet and visible spectroscopy	CD	-	MD
Aspects of the pharmaceutical industry	WM	MD	_

#### Advance warning

The following items needed for activities in this unit may not already be in your school, and might take a little time to obtain.

Activity	Item(s)	Essential/Optional	Typical quantity per experiment
MD5.1	* 6-Aminopenicillanic acid (6-APA). * Bacillus subtilis living culture on agar * Nutrient agar	Essential Essential Essential Essential Essential Essential	1 g
	Autoclavable plastic bags (or roasting bags) Disposable sterile syringes Sterile plastic Petri dishes with lids	Essential Essential Optional	4

A special safety note Special care should be taken when handling the bacterial cultures in Activity MD5. You should ensure that technicians and students are aware of the correct procedure (see pages 118–120).

\* Current suppliers are listed on the Salters Advanced Chemistry Web Site.

