

Higher National Unit Specification

General information for centres

Unit title: Organic Stereochemistry

Unit code: DX2H 35

Unit purpose: This Unit is most likely to be delivered as part of the HND Applied Chemistry course although it may be suitable for inclusion in another HND Science award. It is designed to give candidates the opportunity to develop their knowledge and understanding of stereochemistry in selected organic compounds, and their understanding of chirality in selected organic compounds.

On completion of the Unit the candidate should be able to:

- 1 Explain and apply the principles of stability, conformational analysis and stereochemistry to alicyclic hydrocarbons and describe reactions of these compounds.
- 2 Analyse the configuration of compounds with more than one chiral centre and describe reactions, which generate a second chiral centre.
- 3 Describe uses and implications of stereochemistry.

Credit points and level: 1 HN Credit at SCQF level 8: (8 SCQF credit points at SCQF level 8*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Recommended prior knowledge and skills: Access is at the discretion of the centre, although it is recommended that candidates should have completed the HN Unit: Fundamental Concepts of Organic Chemistry (DP2P 34).

Core Skills: There are opportunities to develop the Core Skills of Problem Solving and Communication at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: Outcome 1 and Outcome 2 will be assessed by a closed-book end-of Unit assessment. The closed-book assessment should be worth 50 marks and a score of 60% would be required to pass. The questions should reflect a representative sample from the content detailed in the support notes.

Outcome 3 will be assessed by a report or case study of approximately 1,000 words.

Higher National Unit specification: statement of standards

Unit title: Organic Stereochemistry

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain and apply the principles of stability, conformational analysis and stereochemistry to alicyclic hydrocarbons and describe reactions of these compounds

Knowledge and/or skills

- ◆ Molecular orbital theory.
- ◆ Stability
- ◆ Conformational analysis
- ◆ Reactivity
- ◆ Chemical reactions

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ use molecular orbital theory to explain the stability/reactivity of a range of cycloalkanes/cycloalkenes
- ◆ analyse the conformation of a range of cyclic compounds
- ◆ describe the reactions of a range of cyclic compounds that would lead to the formation of specific stereoisomers

Assessment guidelines

The holistic assessment for Outcomes 1 and 2 should be worth 50 marks, with the weighting being reflective of the amount of work in the knowledge and skills items. All knowledge and skills items must be assessed. The questions set in the assessment should cover a representative sample of topics suggested in the support notes. There should be a mixture of short answer and structured questions in each part of the assessment. The pass mark for the assessment will be 60%. Should candidates fail to gain 60% marks they should be offered a second attempt after sufficient remediation. The holistic assessment for Outcomes 1 and 2 should be closed-book.

Higher National Unit specification: statement of standards (cont)

Unit title: Organic Stereochemistry

Outcome 2

Analyse the configuration of compounds with more than one chiral centre and describe reactions, which generate a second chiral centre

Knowledge and/or skills

- ◆ Two Centre Configuration
- ◆ Chemical reactions

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ analyse compounds with more than one chiral centre and assign their configuration
- ◆ describe reactions that lead to the formation of compounds with two chiral centres

Assessment guidelines

The holistic assessment for Outcomes 1 and 2 should be worth 50 marks, with the weighting being reflective of the amount of work in the knowledge and skills items. All knowledge and skills items must be assessed. The questions set in the assessment should cover a representative sample of topics suggested in the support notes. There should be a mixture of short answer and structured questions in each part of the assessment. The pass mark for the assessment will be 60%. Should candidates fail to gain 60% marks they should be offered a second attempt after sufficient remediation. The holistic assessment for Outcome 1 and 2 should be closed-book.

Outcome 3

Describe the importance of stereochemical considerations in a natural or commercial product

Knowledge and/or skills

- ◆ Commercial importance of the compound
- ◆ describe the stereochemical of the compound
- ◆ Implications of the stereochemistry on the uses of the compound

Evidence Requirements

Candidates will need to demonstrate their knowledge and/or skills by showing that they can:

- ◆ produce a report or case study for one application of stereochemistry

Higher National Unit specification: statement of standards (cont)

Unit title: Organic Stereochemistry

Assessment guidelines

The assessment should be assessed by a report or case study on an application of stereochemistry. Some suggested topics for the case study are in the support notes. The report should be approximately 1,000 words. Should candidates fail to produce a suitable report or case study, a second attempt should be made using a different stereochemical application.

Assessment should be done by the student in their own time. The report should include material from a variety of sources which should be referenced correctly.

Administrative Information

Unit code: DX2H 35
Unit title: Organic Stereochemistry
Superclass category: RD
Original date of publication: August 2006
Version: 01

History of Changes:

| Version | Description of change | Date |
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Higher National Unit specification: support notes

Unit title: Organic Stereochemistry

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This Unit is intended to be part of the HND Chemistry course. It may also be suitable for inclusion in other science HND awards.

Outcome 1

Candidates should be able to:

- ◆ Explain the stability and reaction of cycloalkanes, this may include the stability and reactions of cyclopropane, cyclobutane, cyclopentane and cyclohexane. To achieve this candidates will require a knowledge of molecular orbital theory.
- ◆ Conformational analysis of cyclohexane should be studied this will include chair, boat and twist boat conformation. The variation in energy of the conformations of cyclohexane. Derivatives of cyclohexane should be studied for conformation and stereochemistry.
- ◆ Cyclic alkenes should be studied including the reactions of these compounds and related stereochemistry.
- ◆ Cyclic alkanes should be studied for the reactions of these compounds and related stereochemistry.

Outcome 2

Candidates should be able to:

- ◆ Specify the configuration of organic compounds with more than one chiral centre.
- ◆ Show how a second chiral centre can be generated by reactions of chiral molecules.

Outcome 3

The following applications are examples, which may be selected as topics for the case study. The examples are not exhaustive and other suitable examples may be used.

- ◆ Carbohydrates — configuration of carbohydrates, synthesis of carbohydrates, D and L stereochemistry.
- ◆ Use of a chiral catalyst to produce a chiral compound.
- ◆ Chirality and stereochemistry in nature.
- ◆ Activity of stereoisomers in drug synthesis, eg a case study on Thalidomide.

Higher National Unit specification: support notes (cont)

Unit title: Organic Stereochemistry

Guidance on the delivery and assessment of this Unit

This Unit forms part of the mandatory section for the HND Chemistry.

The holistic assessment for Outcome 1 and Outcome 2 should be worth 50 marks, with the weighting being reflective of the amount of work in the knowledge and skills items. All knowledge and skills items must be assessed. The questions set in the assessment should cover a representative sample of topics suggested in the support notes. There should be a mixture of short answer and structured questions in each part of the assessment. The pass mark for the assessment will be 60%. Should candidates fail to gain 60% marks they should be offered a second attempt after sufficient remediation.

This assessment should be assessed by a report or case study on an application of stereochemistry. The report should be approximately 1,000 words. Should candidates fail to produce a suitable report or case study. A second attempt should be made using a different stereochemical application detailed in the knowledge and/or skills section.

Opportunities for developing Core Skills

Given the nature of this Unit, there will be opportunities to develop Problem Solving and Communication at SCQF level 6. The production of the written report will help develop communication skills, while the complex nature of the subject will require good analytical and problem solving skills.

Open learning

If this Unit is delivered by open or distance learning methods, additional planning resources may be required for candidate support, assessment and quality assurance.

A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes. It would be necessary for the closed-book assessment to be undertaken under controlled conditions. This may be possible if the candidate can attend a centre close to their home. This will be necessary unless an on-line form of assessment can be introduced.

For further information and guidance, please see *Assessment and Quality Assurance of Open and Distance Learning* (SQA, February 2001, publication code A1030).

Candidates with disabilities and/or additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Alternative Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on SQA's website: www.sqa.org.uk.

General information for candidates

Unit title: Organic Stereochemistry

This is a 1 credit SQCF level 8 Unit, intended to be delivered as part of an HND Chemistry/Science qualification. It is likely to be delivered in the second year of the programmes. There are many examples where the stereochemistry of a compound dictates its reactivity and hence the use it can be put to. In some cases one isomer is an effective drug, while the other isomer is inactive. This Unit looks at the factors that can influence such behaviour in compounds.

On completion of this Unit you should be able to:

- 1 Explain and apply the principles of stability, conformational analysis and stereochemistry to alicyclic hydrocarbons and describe reactions of these compounds.
- 2 Analyse the configuration of compounds with more than one chiral centre and describe reactions, which generate a second chiral centre.
- 3 Describe uses of stereochemistry.

The main components of the Unit are described in more detail below:

Outcome 1

In this Outcome you will cover the concept of conformation, stability and stereochemistry of cyclic organic compounds. This will include the study of a variety of cycloalkanes and cycloalkenes. You will also study how these compounds react and the stereochemistry of the products. The work is likely to focus on the reactions of C₅ and C₆ cycloalkanes and cycloalkenes.

Outcome 2

You will study compounds with more than one chiral centre, how to assign the configuration of each centre. You will also study reactions that lead to the formation of a second chiral centre.

Outcome 3

In this Outcome you will carry out a case study and produce a report on an application of stereochemistry. The choice of topic should be open, with subjects as the Thalidomide drug being one possibility.

Assessment

Outcome 1 and Outcome 2 will be assessed using a single end of Unit assessment. The assessment will be closed-book

Outcome 3 will be assessed by a report or case study. The report or case study will be approximately 1,000 words long. The report/case study will be on an application of stereochemistry.