



Higher National Unit specification

General information for centres

Unit title: Dental Biomaterials

Unit code: F1M6 34

Unit purpose: This Unit covers the science of dental biomaterials used in procedures and construction of dental appliances. The Unit is concerned with the development of scientific knowledge and understanding required to enable correct selection, manipulation and safe handling of dental biomaterials that relate to the work of a dental technician. This Unit will support other practical Units within the framework.

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

- 1 Explain the underpinning science of dental biomaterials.
- 2 Explain the limitations of dental biomaterials.
- 3 Explain the safety aspects of biomaterials in the dental laboratory.

Credit points and level: 1 HN credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

**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 to this Unit is at the discretion of the centre. It would be beneficial that candidates complete a locally devised programme of National Qualification Units in Dental Technology at SCQF level 6. Candidates could also have completed an induction to dental technology course.

Core Skills: There are opportunities to develop the Core Skills of Communication to SCQF level 6, Using Information Technology at SCQF level 6 and Problem Solving to 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.

General information for centres (cont)

Assessment: The assessment of this Unit could be carried out holistically using a single instrument of assessment or it could be broken down into three separate assessment events which assess each Outcome separately.

It is recommended that if a holistic assessment approach is adopted the assessment event could consist of a number of restricted response questions, which may last no more than one hour and thirty five minutes, carried out under supervised, controlled conditions. This assessment should be carried out at the end of the delivery of the Unit.

Where separate instruments of assessments are used, it is recommended that for each Outcome the assessment should last no more than 45 minutes.

Higher National Unit specification: statement of standards

Unit title: Dental Biomaterials

Unit code: F1M6 34

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 the underpinning science of dental biomaterials

Knowledge and/or Skills

- ◆ Classification of dental biomaterials
- ◆ Composition and use of dental biomaterials
- ◆ Physical structure and properties of dental biomaterials
- ◆ Testing of dental biomaterials

Evidence Requirements

Evidence for the Knowledge and/or Skills in this Outcome will be provided on a sample basis and this will occur within certain Knowledge and/or Skills. In order to ensure that candidates will not be able to foresee what items they will be questioned about, a different sample of the Knowledge and/or Skills items is required each time the Outcome is assessed.

- ◆ explain dental biomaterials using the classifications, candidates should explain the first two elements listed below and one from the remaining list:
 - Polymeric
 - Ceramic
 - Composite
 - Investment
 - Adhesive
- ◆ explain the type; constituents; properties; and uses of following dental biomaterials, candidates should explain the first two elements listed below and one from the remaining list:
 - Denture base materials
 - Dental porcelain
 - Dental composites
 - Investment materials
 - Metals and alloys
 - Solders and fluxes
 - Permanent resilient lining materials

Higher National Unit specification: statement of standards (cont)

Unit title: Dental Biomaterials

- ◆ explain testing processes for dental biomaterials candidates should explain four from the nine elements listed below:
 - Stress — strain relationship
 - Transverse strength
 - Tensile strength
 - Compressive strength
 - Impact strength
 - Proportional limit
 - Elastic limit
 - Abrasion resistance
 - Hardness

Evidence for this Outcome should be generated under controlled conditions. Re-assessment event will require an alternative sample.

Assessment Guidelines

See Outcome 3.

Outcome 2

Explain the limitations of dental biomaterials

Knowledge and/or Skills

- ◆ Physical structure
- ◆ Limitations of biomaterials
- ◆ Electroplating
- ◆ Electrolytic brightening
- ◆ Electronic cell

Evidence Requirements

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

- ◆ explain the physical structural demands that the oral cavity applies to biomaterials, including: effects of time; oral fluids, and the galvanic cell
- ◆ explain electroplating and electrolytic brightening and the formation of an electronic cell

Assessment Guidelines

See Outcome 3.

Higher National Unit specification: statement of standards (cont)

Unit title: Dental Biomaterials

Outcome 3

Explain the safety aspects of biomaterials in the dental laboratory

Knowledge and/or Skills

- ◆ Safe Operating Procedures (SOPs)
- ◆ Control of Substances Hazardous to Health (COSHH)

Evidence Requirements

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

- ◆ explain the purpose of Safe Operating Procedures (SOPs) and the requirements under current Health and Safety legislation
- ◆ explain the current Control of Substances Hazardous to Health regulations (COSHH), including:
 - Risk Assessment
 - Safe Handling Procedures including storage and disposal
 - Hazard Data Sheets
 - Warning Symbols.

Assessment Guidelines for the Unit

Assessment, for all Outcomes, could be carried out holistically as a single assessment lasting one hour and 35 minutes. The assessment could be in the form of a short answer paper, completed under restricted open-book conditions, ie the candidate would be permitted access to a limited amount of materials, such as one A4 sheet of notes. The candidate's notes would be submitted with the candidate's answer.

It would be possible, to assess each Outcome separately. Where separate instruments of assessments are used it is recommended they should take 45 minutes each. Candidates would be permitted to bring with them one side of an A4 page of notes, submitted with the candidate's answer.

Administrative Information

Unit code: F1M6 34
Unit title: Dental Biomaterials
Superclass category: PF
Original date of publication: January 2008
Version: 01

History of changes:

Version	Description of change	Date

Source: SQA

© Scottish Qualifications Authority 2008

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

Higher National Unit specification: support notes

Unit title: Dental Biomaterials

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

The purpose of this Unit is to allow candidates to develop knowledge and understanding of how the health and physical state of a patient and their oral tissues influence the activities of the dental technician.

It is envisaged that the teaching of this Unit could be delivered through lecturer mediated discussion, practical demonstrations and the reading of recommended texts.

A list of topics for each Outcome is given below.

Outcome 1

In this Outcome candidates should be able to demonstrate competence in reviewing the underpinning science of dental biomaterials used by dental technicians.

The candidate may be able to describe the properties used to characterise the materials used in the oral cavity:

- ◆ Mechanical
- ◆ Thermal
- ◆ Adhesive
- ◆ Physical
- ◆ Chemical
- ◆ Biological

The candidate may be able to describe the process of polymerisation and the characteristics of rigid non-metallic dental base materials. This could include:

- ◆ Types
- ◆ Constituents
- ◆ Chemistry of polymerisation
- ◆ Possible faults during polymerisation
- ◆ Properties

Higher National Unit specification: support notes (cont)

Unit title: Dental Biomaterials

The candidate may be able to describe the constituents, properties and uses of permanent resilient lining materials, dental porcelain, dental composites, refractory (investment) materials, metals and alloys, solders and fluxes. This could include:

- ◆ Types
- ◆ Constituents
- ◆ Properties
- ◆ Uses

The candidate may be able to describe the testing procedures applied to dental biomaterials and identify the appropriate test for each material. The procedures should test dental biomaterials mechanical properties for their stress — strain relationship to ensure that they can withstand the physical forces applied to them during function within the oral cavity. The materials could also be tested to discover their:

- ◆ Transverse strength
- ◆ Tensile strength
- ◆ Compressive strength
- ◆ Impact strength
- ◆ Proportional limit
- ◆ Elastic limit
- ◆ Abrasion resistance
- ◆ Hardness

Outcome 2

In this Outcome candidates should be able to describe the limitations of these biomaterials.

The candidate may be able to describe the principles of an electrolytic cell and relate this to electroplating and electrolytic brightening of metallic dental restorations. This could include:

- ◆ Faraday's 1st Law of Electrolysis
- ◆ Current flow, anode and cathode reaction in an electrolytic cell
- ◆ Constituents of electrolytes and the process of electroplating
- ◆ Constituents of electrolytes and the process of electrolytic brightening

The candidate may be able to describe the principles of a galvanic cell and relate this to corrosion in the oral environment. This could include:

- ◆ Allocation of electrode potentials to metals and the relationship to the electrochemical series
- ◆ Current flow and electrode reaction between metals
- ◆ Conditions leading to galvanic reactions being created within the oral environment
- ◆ Formation of a metallic oxide layer
- ◆ Reasons for preventing corrosion and tarnish on dental restorations

Higher National Unit specification: support notes (cont)

Unit title: Dental Biomaterials

Outcome 3

In this Outcome candidates should be able to outline the safety aspects of biomaterials that relate to the work of the dental technician.

The candidate may be able to describe Safe Operating Procedures (SOPs) and their impact to the practicing dental technician.

The candidate may be able to outline the Control of Substances Hazardous to Health (COSHH), including: Risk Assessment; Safe Handling Procedures including storage and disposal; Hazard Data Sheets and Warning Symbols.

Guidance on the delivery and assessment of this Unit

It is envisaged that the teaching of this Unit could be delivered through lecturer mediated discussion, practical demonstrations and the reading of recommended texts.

The Assessment of this Unit could be carried out as a single assessment lasting one hour and 35 minutes. The assessment could be completed under restricted open-book conditions. Restricted open-book conditions means that the candidate is permitted access to a limited amount of materials, for example, one A4 sheet of notes.

Alternatively it is possible to break this assessment down into four separate assessment events which assess each Outcome. Where separate instruments of assessments are used they should each last 45 minutes. Candidates could be permitted to bring with them one side of an A4 page of notes.

Opportunities for developing Core Skills

In completing the class work of Outcomes 1 and 2 candidates may have the opportunity to develop the component 'Written Communication (reading)' of the Core Skill Communication at level 6. Candidates will have the opportunity to analyse and evaluate complex information from a variety of dental materials literature sources. The general skill that the candidate may have to complete is 'Read and understand complex written communication'.

There is also the opportunity for the candidate to develop the component 'Critical Thinking' of the Core Skill Problem Solving at SCQF level 6 while completing the class work of Outcome 1. The candidate may identify the tests required of a dental biomaterial and assess their applicability in any given situation. The candidate could then be required to justify their approach with support from the literature. The general skill that the candidate may have to complete is "Analyse a complex situation or issue".

There are opportunities for the candidate to develop Using Information Technology at SCQF level 6 in this Unit. When candidates are involved in their own independent research practical work they will have an opportunity to develop the general skill 'Using an IT system independently to process a range of information'. Candidates may have to complete a number of internet searches to find information and keep their data secure and manage its storage.

Higher National Unit specification: support notes (cont)

Unit title: Dental Biomaterials

In Outcome 3 there is the opportunity for the candidate to further develop the component ‘Written Communication (reading)’ of the Core Skill Communication at level 6. The candidate will be required to understand the Safe Operating Procedures (SOPs) for the equipment within the dental laboratory and the relevant Control of Substances Hazardous to Health (COSHH) and their responsibilities as a dental professional under the current health and safety legislation. The general skill that the candidate may have to complete is “Read and understand complex written communication”.

The assessment of this Unit may also contribute towards the component ‘Written Communication (writing)’ of the Core Skill Communication at SCQF level 6. Candidates may have to structure their responses, which could include complex vocabulary, accurately and using a logical structure. The general skill that candidates may have to complete is ‘Produce well-structured written communication on complex topics’.

Open learning

This Unit could be delivered by distance learning, which may incorporate some degree of online support. With regard to assessment for Outcome 1 to 3, planning would be required of the centre concerned to ensure the sufficiency and authenticity of the candidate evidence. Arrangements may need to put in place to ensure that assessment was conducted under controlled, supervised conditions.

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. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* (www.sqa.org.uk).

General information for candidates

Unit title: Dental Biomaterials

This Unit has been designed to develop your knowledge and understanding of the science of dental materials used in the construction of dental appliances.

The Unit has three main areas, each the subject of a separate Outcome. Firstly you will be looking at the underpinning science of the dental biomaterials used by the dental technician. You will then explore the limitations of these biomaterials. This is then followed by the investigation of the safety aspects of biomaterials that relates to the work of a dental technician.

On completion of this Unit you will be able to:

- ◆ explain the underpinning science of dental biomaterials
- ◆ explain the limitations of these biomaterials
- ◆ explain the safety aspects of biomaterials

Assessment of this Unit could be carried out holistically as a single assessment which may last one hour and 35 minutes. The assessment could be in the form of a short answer paper, which may be completed under restricted open-book conditions. Restricted open-book conditions may mean that you are permitted access to a limited amount of materials, for example, one A4 sheet of notes. Your notes may be submitted with your answer.

However, you may be assessed in three separate assessment events. Where separate instruments of assessments are used they may take 45 minutes each. You may be permitted to bring with you one side of an A4 page of notes. Your notes may be submitted with your answer.