



## Higher National Unit specification

### General information

**Unit title:** Anatomy and Physiology for Orthotics and Prosthetics  
(SCQF level 7)

**Unit code:** HE2K 34

**Superclass:** PE

**Publication date:** May 2016

**Source:** Scottish Qualifications Authority

**Version:** 01

### Unit purpose

This Unit is designed to provide the learner with a good working knowledge of human anatomy and physiology as it relates to orthotics and prosthetics. The Unit covers the development of the systems of the human body focussing on the musculo-skeletal system. The Unit also provides underpinning knowledge for the more technical Units of the PDA Orthotics and Prosthetics and the learner will be expected to identify the superficial, bones, tendons, muscles and joints of the human body. Finally the Unit will investigate common conditions requiring orthotic or prosthetic management.

### Outcomes

On successful completion of the Unit the learner will be able to:

- 1 Describe the gross anatomy and physiology of selected body systems.
- 2 Describe the development, anatomy and physiology of the musculo-skeletal system.
- 3 Identify and describe bone and joint structures and surface anatomy.
- 4 Investigate conditions requiring orthotic or prosthetic management.

### Credit points and level

1 Higher National Unit credit at SCQF level 7: (8 SCQF credit points at SCQF level 7)

## Higher National Unit specification: General information (cont)

**Unit title:** Anatomy and Physiology for Orthotics and Prosthetics  
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### Recommended entry to the Unit

Ultimately access to the Unit is at the discretion of the centre, however a knowledge of *Anatomy and Physiology* at level 6 would be beneficial. In addition a familiarity with the working practice of orthotics and prosthetics would help the learner to put the learning in context. It is therefore recommended that this Unit is undertaken by individuals who are currently working in an orthotic or prosthetic area.

### Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes for this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

### 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.

This Unit is delivered as part of the PDA Rehabilitative Technologies Group Award, it is recommended that it should be taught and assessed within the subject area of that Group Award.

### Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website [www.sqa.org.uk/assessmentarrangements](http://www.sqa.org.uk/assessmentarrangements).

## Higher National Unit specification: Statement of standards

**Unit title:** Anatomy and Physiology for Orthotics and Prosthetics  
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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

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. Learners 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

Describe the gross anatomy and physiology of selected body systems.

#### Knowledge and/or Skills

- ◆ Gross anatomy and physiology of the nervous system
- ◆ Gross anatomy and physiology of the cardio vascular system
- ◆ Gross anatomy and physiology of the integumentary system
- ◆ Gross anatomy and physiology of the immune system.

### Outcome 2

Describe the development, anatomy and physiology of the musculo-skeletal system.

#### Knowledge and/or Skills

- ◆ Development and function of bone
- ◆ Development and function of muscles
- ◆ Joint classification; synovial, fibrous and cartilaginous.
- ◆ Anatomy and physiology of the musculo-skeletal system
- ◆ Degeneration of the musculo-skeletal system

## Higher National Unit specification: Statement of standards

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### Outcome 3

Identify and describe bone and joint structures and surface anatomy.

#### Knowledge and/or Skills

- ◆ Locate and identify the main bones of the skeleton:
  - skull
  - spine (cervical, thoracic, lumbar, sacrum, coccyx)
  - clavicle
  - scapula
  - sternum
  - ribs
  - humerus
  - radius
  - ulna
  - pelvis (ilium, ischium, pubis, ischial tuberosities)
  - femur
  - patella
  - tibia
  - fibula
  - Calcaneus and Talus
  - Navicular and Tarsal bones
  - Metatarsals
  - Great Hallux
  - Phalanges
  
- ◆ Locate and palpate superficial bony points:
  - occipital protuberance
  - spinous processes
  - scapula and superior angle/border
  - medial border and spine
  - sternum
  - manubrium
  - body and xiphoid process
  - humerus
  - greater tubercle
  - medial and lateral epicondyles
  - ulna — olecranon and styloid process
  - radius — head and styloid process
  - heads of metacarpals
  - pelvis
  - iliac crest
  - ASIS (anterior, superior iliac spine)
  - Femur
  - greater trochanter
  - medial and lateral epicondyles

## Higher National Unit specification: Statement of standards (cont)

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- tibia
  - medial and lateral condyles
  - tibial tuberosity
  - anterior border
  - medial malleolus
  - fibula — Head and lateral malleolus
  - metatarsals —1st and 5th heads
  - base of 5th and tubercle of navicular
- ◆ Locate superficial muscles and tendons:
- pectoralis major
  - biceps
  - biceps femoris
  - semitendonosus/ semimembranous patellar tendon
  - adductor longus
  - tendo achilles'
- ◆ Locate and demonstrate the types of movement associated with the following joints:
- ball and socket
  - pivot
  - hinge
  - gliding/Plane
  - saddle
  - ellipsoid/condyloid

### Outcome 4

Investigate conditions requiring orthotic or prosthetic management.

#### Knowledge and/or Skills

- ◆ Describe the aetiology of common conditions requiring orthotic or prosthetic management
- ◆ Common conditions requiring orthotic management are:
- Cerebral palsy
  - Spina bifida
  - Degenerative bone conditions
  - Scoliosis
  - Stroke
  - Muscular dystrophies
  - Multiple Sclerosis

## Higher National Unit specification: Statement of standards (cont)

**Unit title:** Anatomy and Physiology for Orthotics and Prosthetics  
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- ◆ Common conditions requiring prosthetic management are:
  - Vascular disease
  - Diabetes
  - Congenital deficiencies
  - Trauma
- ◆ Describe the altered anatomy and physiology of the conditions and impact on individual's life
- ◆ Explain the orthotic or prosthetic management of these conditions
- ◆ Describe the prognosis for the individual

### Evidence Requirements for this Unit

Learners will need to provide evidence to demonstrate their Knowledge and/or Skills across all Outcomes by showing that they can:

#### Outcome 1

- ◆ describe the anatomy and physiology of two body systems.

#### Outcome 2

- ◆ describe the development and function of bone.
- ◆ describe the development and function of muscles.
- ◆ discuss a minimum of one joint classification and type.
- ◆ describe the gross anatomy of the musculo-skeletal system.
- ◆ investigate the degeneration of the musculo-skeletal system associated with ageing and disease.

#### Outcome 3

- ◆ identify a minimum of 10 bony points and five superficial tendons and locate and demonstrate the range of movement in three types of joints.

#### Outcome 4

- ◆ describe the aetiology of one condition selected from the range identified in the Knowledge and Skills.
- ◆ describe the altered anatomy and physiology of this condition and impact on individual's life.
- ◆ explain the orthotic or prosthetic management of the condition.
- ◆ describe the prognosis for the individual.



## Higher National Unit Support Notes

**Unit title:** Anatomy and Physiology for Orthotics and Prosthetics  
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Unit Support Notes are offered as guidance and 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 is a mandatory Unit within the Professional Development Award in Rehabilitation Technologies SCQF level 7. It is designed to meet the knowledge and skills required by learners in preparation for their role as a prosthetic or orthotic technician. The Unit will support learners to understand their clinical role within a defined scope of practice.

This Unit is designed to provide the learner with a good working knowledge of human anatomy and physiology as it relates to orthotics and prosthetics. The Unit covers the development of the systems of the human body focussing on the skeletal system and the how environmental factors and the aging process affect this system. The Unit provides underpinning knowledge for the more technical Units of the PDA in Orthotics and Prosthetics and the learner will be expected to be able to identify and describe the structure and function of the superficial, bones, tendons, muscles and joints of the human body. Finally, the Unit will investigate common conditions requiring orthotic or prosthetic management.

#### Outcome 1

The aim of this Outcome is to examine the basic anatomy and physiology of the human body. In addition, it is advisable to introduce the learners to the development of the identified body systems. This is a vital foundation for the complete understanding of the anatomy and physiology of the human body as it applies to the practice of orthotics and prosthetics.

#### Outcome 2

This Outcome investigates the development of the musculo–skeletal system. This should include the development and function of the skeletal system; of bone tissue; osteogenesis or ossification in utero and its completion at around the 21st year of life. The development of different types of bone; long, short and irregular (cartilage model), flat bone development (membrane model) and sesamoid bones (tendon model). The structure and development of all types of bones should include spongy bone, medullary canal, periosteum, compact bone, blood and nerve supply, epiphysis, diaphysis, and articular cartilage.

## Higher National Unit Support Notes (cont)

**Unit title:** Anatomy and Physiology for Orthotics and Prosthetics  
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The hormonal regulation of bone should be investigated in terms of growth hormone, testosterone and oestrogen, and the effect that the menopause, aging and degeneration has on bone tissue and structure. The process and causes of bone degeneration should be explored and the effect that this degeneration has on the integrity and stability of bone discussed. The effects of health eating, exercise on bone and muscle health should also be investigated.

The development and structure of the vertebral column should be explained, this should include the intervertebral discs, foramen, ligaments and curves of the vertebral column. The function and movement of the vertebral column should also be explained.

The learner should be familiar with skeletal muscles as compared to cardiac and smooth muscle types. Major muscles groups should be described and identified including the origin and insertion points of muscles.

The different joint classification should be explained; synovial, fibrous and cartilaginous and specific synovial joints types investigated including:

- ◆ Ball and socket
- ◆ Pivot
- ◆ Hinge
- ◆ Gliding/plane
- ◆ Saddle
- ◆ Ellipsoid/Condylloid

The learner must understand the different functions of each of these joint types and where they are found in the skeleton. While investigating the structure and function of muscles and joints the learner should also gain an understanding of the structure, function and location of ligaments and tendons within the musculo- skeletal system. The learner should therefore develop have a clear understanding of the mechanics of movement in relation to the musculo-skeletal system.

### Outcome 3

The learners must be familiar with the knowledge and skills as identified in the Evidence Requirements for Outcome 3. The learners must be given the opportunity to identify the bony points, tendons and joints of the human body. This is essential for the effective practice and application of orthotics and prosthetics. The learner must be familiar with these points and be able to identify them in the human body in order to be proficient in their application of theory to practice.



## Higher National Unit Support Notes (cont)

**Unit title:** Anatomy and Physiology for Orthotics and Prosthetics  
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### Outcome 4

The learners should carry out an investigation into one common condition requiring either orthotic or prosthetic management.

- ◆ Orthotic management:
  - Cerebral palsy
  - Spina bifida
  - Degenerative bone conditions
  - Scoliosis
  - Stroke
  - Multiple sclerosis
  
- ◆ Prosthetic Management:
  - Vascular disease
  - Diabetes
  - Congenital deficiencies
  - Trauma

For degenerative bone conditions the learner should explore conditions associated with aging or degenerative diseases such as; arthritis, osteoporosis, or muscular dystrophies, this could be described in terms of restriction of movement, pain and loss of function and effects on associated structures. In terms of trauma the learner must consider the consequences of the loss of a limb or nerve damage and the effects that this has on associated structures and movement.

The learner must research the aetiology of the selected condition and the changes that this condition causes to the anatomy and physiology of the affected body systems. The impact that this condition has on the individuals' life must also be described; pain, loss of independence, increasing, permanent or short term disability, altered body image, changes in lifestyle and aspiration. The learner must detail the orthotic or prosthetic management required for the selected condition and the long-term prognosis that the condition has for orthotic or prosthetic management.

### Guidance on approaches to delivery of this Unit

Outcome 1 — basic anatomy and physiology of the human body gives the learner a broad understanding of the structure and function of the human body before moving onto knowledge, understanding and practical skills are covered. This Outcome should be taught through a range of theory, group work, presentations and research. This Outcome should be taught first in the Unit.

## Higher National Unit Support Notes (cont)

**Unit title:** Anatomy and Physiology for Orthotics and Prosthetics (SCQF level 7)

Outcome 2 — this Unit looks at the development, structure and function of bones and muscles across all ages and relates this specifically at its relevance to orthotics and prosthetics. The Outcome covers how hormones, diet and exercise and aging affect the skeletal system. In addition, the structure and function of muscles and tendons is investigated. The learner must gain an understanding of the different joint structures within the skeleton and the mechanics of movement. This Outcome should be delivered second.

Outcome 4 — this looks at common conditions that require orthotic or prosthetic management. The Outcome therefore builds on the knowledge and understanding gained in Outcomes 1 and 2. It is therefore appropriate to teach this Outcome after Outcomes 1 and 2. It would be suitable to create an integrated assessment covering Outcomes 1, 2, 4 which requires the learner to research a condition, that requires orthotic/prosthetic management, explaining, the basic anatomy and physiology, bone and joint structures and changes.

Outcome 3 — this is a practical Outcome and the learners must be able to locate and identify specific body structures. This means that the learner must have the opportunity to work with live models and anatomical models to become familiar with the required anatomical structures. This should be assessed through an assessor's checklist that covers the Evidence Requirements.

### Guidance on approaches to assessment of this Unit

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

In order to achieve this Unit, learners are required to submit sufficient evidence to demonstrate they have met the knowledge and skills requirements for each Outcome.

An understanding of the both anatomy and physiology and its application to orthotic/prosthetic practice is a requirement for successful achievement of the Unit.

Evidence can be generated using different types of instruments of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

It is suggested that the Unit is assessed in the following ways:

**Outcomes 1, 2 and 4** could be assessed through a research project that covers the following:

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The learner should research one common condition requiring orthotic or prosthetic management and relate the following points to the selected condition:

- ◆ Describe the anatomy and physiology of two body systems.
- ◆ Describe the development of relevant bone and muscles structures.
- ◆ Discuss a minimum of one joint classification and type.
- ◆ Describe the altered anatomy and physiology caused by the selected condition and the impact on individual's life.
- ◆ Explain the orthotic or prosthetic management of the condition
- ◆ Describe the prognosis for the individual.

This assessment could be authenticated through an anti-plagiarism software package and a signed statement of originality from the learner.

**Outcome 3** could be assessed through a practical demonstration which establishes the learner's Knowledge and/or Skills by showing that they can correctly identify a minimum of 10 bony points and five superficial tendons and locate and demonstrate the range of movement in three types of joints.

Learners will be assessed by direct or video observation using an assessor checklist. A random sample of all skills sections will be selected for assessment. The learner will be required to demonstrate skills and knowledge on a live model for all except the location of bones, in this instance an anatomical model/skeleton can be used.

### Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at [www.sqa.org.uk/e-assessment](http://www.sqa.org.uk/e-assessment).

### Opportunities for developing Core and other essential skills

There are opportunities to develop the Core Skills of *Communication* at SCF level 5 in this Unit.

*Communication*: this will be evidenced via the learner's work with individuals and groups in the workplace.

## History of changes to Unit

Version	Description of change	Date

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## General information for learners

**Unit title:** Anatomy and Physiology for Orthotics and Prosthetics  
(SCQF level 7)

This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

In this Unit the learner will explore the gross anatomy and physiology of selected body systems together with the specific development and anatomy and physiology of the musculo-skeletal system. This will give you a good underpinning knowledge and understanding of the systems involved in the orthotic and prosthetic management of conditions and diseases. You will investigate some of these conditions and gain an understanding of what these conditions do to the body systems you have looked into. You will research the effect that these conditions have on the life of the individual and what can be done from an orthotic or prosthetic perspective to support and manage the condition.

You will also in this Unit learn about applied anatomy; that is recognising and being able to identify certain anatomical structures on live models or mannequins. You will be expected to locate certain muscles, bones, joints and tendons on these models.

The assessments for this Unit are a practical assessment in applied anatomy and a research investigation where you look into a selected condition requiring orthotic or prosthetic management.

There are no certificated Core Skills in this Unit but you will develop Core Skills in *Communication*.

The British Association of Prosthetists and Orthotists support the qualification that this Unit belongs to and the PDA in Rehabilitative Technologies is recognised as a training programme for prosthetic and orthotic technicians.