Cambridge TECHNICALS

Accredited

OCR LEVEL 3 CAMBRIDGE TECHNICAL

CERTIFICATE/DIPLOMA IN

HEALTH AND SOCIAL CARE

PHYSIOLOGY OF CO-ORDINATION

L/600/8986

LEVEL 3 UNIT 22

GUIDED LEARNING HOURS: 60

UNIT CREDIT VALUE: 10

OCR

PHYSIOLOGY OF CO-ORDINATION

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LEVEL 3 UNIT 22

AIM OF THE UNIT

We live and move around in a constantly changing and sometimes dangerous world. We need to be aware of what is going on around us in order to interact with our environment and to take avoiding action if necessary. For this we depend on our senses of sight, sound, balance, smell, taste and touch. We need to respond to any changes and for this we need a nervous system. The brain interprets the information produced by our senses and makes rapid decisions on appropriate actions. In some individuals their brains function differently and they can taste words or see letters and numbers as colours. This ability often runs in families. Sometimes it occurs as the result of a disorder such as a stroke. Through this unit the learner will develop an understanding of the sense organs and how they are connected to the different components of the nervous system.

It is equally important that we are aware of changes to our internal environment as maintaining an internal equilibrium is essential to life. The nervous system is involved in this process too along with the endocrine system. The learner will develop an understanding of the role of this system and how hormones travel around our bodies bringing about either quick short term effects, like adrenalin, or longer slower acting effects as is brought about by the growth and sex hormones. As with any body system, things can sometimes go wrong and several common disorders, for example diabetes and multiple sclerosis, involve malfunctions of the sense organs, nervous and endocrine systems. The learner will have the opportunity to study two such disorders.

PURPOSE OF THE UNIT

All of us as we age are likely to be affected by a gradual impairment of sight and hearing. Some individuals are affected from birth or as a result of infection or injury. Current lifestyle choices have seen the incidence of diabetes increase dramatically and the lengthening of the human lifespan in the developed world means that those affected by dementia are also increasing. It is therefore certain that any learner entering the health and social care sector as a career will in some capacity or other encounter individuals with disorders of the sensory, nervous and endocrine systems. They are also likely to have family or friends diagnosed with such disorders or impairments. Studying this unit will enable learners to gain an understanding of both the structure and organisation of the systems involved together with their functions.

Learners will initially gain an overall awareness of the roles of nervous and endocrine systems before exploring the structure and function of the main sense organs that through the detection of stimuli allow us to be aware of events in the external environment. They will then learn about the composition of the nervous system and how it consists of a number of integrated systems some of which we are aware, whilst others remain under unconscious control in most individuals. Learners will discover how the nervous system is not just involved in responding to stimuli from the external environment but also from within. They will learn about the sympathetic and parasympathetic systems and how these systems work antagonistically to either prepare the body for action or restore it to a resting state. Studying this unit will enable learners to understand how nerves work and how their functioning is dependent on the structure of the nerve cells. This in turn will allow them to understand the cause and effects of a disorder such as multiple sclerosis. They will learn

how nerve messages are passed between individual nerve cells and how some medicines such as painkillers make use of this mechanism.

Learners will study the action of a number of hormones, the chemical messengers that travel in the blood stream, and how they are produced by the endocrine system. They will have the opportunity to discover how the various systems sometimes work together to bring about a particular action. Learners will also have the opportunity to investigate how hormone levels regulate body functions and why it is so important that the internal environment of the body is maintained at equilibrium. To this end they will investigate how the body responds to variations in two named examples of factors such as calcium or glucose levels.

Learners will study two disorders – one of the nervous system, the other of the endocrine system. They will investigate the care strategies including possible treatment and will have the opportunity to explore the effects of these disorders on the daily lives of those affected by them as well as considering the support available to such individuals. This may be from appropriate practitioners, care providers, charities or through the use of equipment that facilitates independence.

This unit will build on any existing knowledge of human anatomy and physiology and the scientific principles gained will support learners and link with several other physiology or scientific units within a programme of study. Standing alone it allows learners to develop a sound comprehension of the importance of those systems of the body involved in co-ordination and the consequences of any malfunction. The unit will be useful for those learners intending to work in health or social care or who wish to progress to further or higher education.

ASSESSMENT AND GRADING CRITERIA

Learning Outcome (LO) The learner will:	**Pass** The assessment criteria are the pass requirements for this unit. The learner can:	**Merit** To achieve a merit the evidence must show that, in addition to the pass criteria, the learner is able to:	**Distinction** To achieve a distinction the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
1 Know how the body is coordinated	P1 describe the roles of the nervous and endocrine systems in the coordination of the human body	M1 describe, using examples, how the sensory, nervous and endocrine systems work together in responding to environmental changes	
2 Understand the structure and function of the sense organs	P2 explain the structure of the sense organs in relation to their functioning		
3 Understand the physiology of the nervous system	P3 explain the structure and functioning of the central, peripheral and autonomic nervous systems		
4 Understand the physiology of the endocrine system	P4 explain how the endocrine system contributes to the regulation of the body's internal activities	M2 explain, using examples, how feedback mechanisms operate	D1 analyse the importance of the endocrine system's role in regulating internal activities
	P5 explain the physiological responses made by the body to two selected variables		
5 Understand the effects and management of disorders of the nervous and endocrine systems	P6 explain the care strategies available to manage two disorders of the nervous and endocrine system	M3 analyse the effects of disorders on the daily lives of those individuals affected	D1 evaluate the care strategies and support available the individuals affected

TEACHING CONTENT

1 Know how the body is coordinated

- *Environment:* external (light, sound, orientation, acceleration, scent, taste, touch); internal (temperature, carbon dioxide levels, glucose levels, blood concentration, calcium levels, blood pressure)
- *Nervous coordination:* external and internal stimuli; external and internal receptors – sense organs, barioreceptors, chemoreceptors, hypothalamus; neural pathways; effectors – muscles and glands
- *Endocrine glands:* location in body, structure, hormones secreted by: pituitary gland (anterior and posterior), thyroid and parathyroid glands, adrenal gland (cortex and medulla), islets of Langerhans, testes, ovaries
- *Integration:* Nervous and endocrine coordination (role of hypothalamus and pituitary gland, role of adrenal medulla/actions of adrenalin), heart rate.

2 Understand the structure and function of the sense organs

- *Functions:* sensations - touch, pressure, pain, temperature, taste, sight, hearing, balance , movement
- *Skin:* sensory receptors: Meissner's corpuscles, Pacinian corpuscles, free nerve endings around hair follicles
- *Olfactory and gustatory sense organs:* taste buds, olfactory cells
- *Eye:* conjunctiva, cornea, iris, lens, suspensory ligaments, ciliary muscles, retina (rods and cones), fovea, blind spot, mechanism for adaptation to light intensity, accommodation, colour vision
- *Ear:* structure and function of outer, middle and inner ear, organ of Corti; semi-circular canals.

3 Understand the physiology of the nervous system

- *Central nervous system:* brain, spinal cord
- *Peripheral nervous system:* cranial nerves, spinal nerves;
- *Autonomic nervous system:* sympathetic, parasympathetic
- *Nervous tissue:* neuron structure and neuron types; nerve fibres, myelin sheath, nodes of Ranvier; white matter, grey matter; major parts of the brain (medulla oblongata, cerebellum, thalamus, hypothalamus, corpus callosum, cerebral cortex); spinal cord; meninges
- *Nerve pathways:* reflex arc; afferent nerve fibres, efferent nerve fibres; transmission of a nerve impulse:
- *Nerve action:* resting potential, thresholds, action potential, role of Schwann cells/myelin sheath, nodes of Ranvier, synapses, neurotransmitters.

4 Understand the physiology of the endocrine system

- *Endocrine glands:* Actions at cellular level of: pituitary gland (anterior and posterior), thyroid and parathyroid glands, adrenal gland (cortex and medulla), islets of Langerhans, testes, ovaries
- *Endocrine coordination:* action of hormones, feedback mechanisms.

5 Understand the effects and management of disorders of the nervous and endocrine systems

- *Disorders of the endocrine system:* Diabetes (types I and II), hypo and hyperthyroidism, growth hormone disorders, Addison's disease, Cushing's syndrome
- *Disorders of the nervous system:* multiple sclerosis, Parkinson's disease, motor neurone disease, sciatica, Alzheimer's disease
- *Diagnosis of disorders:* MRI scans, evoked visual response, lumbar puncture, cognitive tests, blood tests
- *Management of disorders:* including medication, surgical treatments, care strategies, lifestyle changes, behaviour changes, mobility aids, immediate first aid, use of complementary therapies.

DELIVERY GUIDANCE

LO1 Know how the body is coordinated

This unit needs to be started as a general class discussion on what is meant by coordination and its value to the body. Examples of sense organs could be identified and their value and purpose discussed. Relevant DVDs or programmes could be viewed if available. Using scenarios the learners could be led to identifying the need for responses by the body and this would allow the need for muscles and glands to be also identified. Learners are then likely to readily link the functions of the nervous system with those of muscles and glands. Scenarios which describe a frightening situation will lead naturally to a mention of adrenalin and if the learners are then asked about the internal environment of the body then they can be guided towards the endocrine system. Once this introduction has been made learners could be set individual or paired research tasks to investigate the roles of the three systems covered in this unit. They could produce a number of short 'story lines' describing various situations involving responses to changes or stimuli in both the external and internal environments, for example seeing and eating a piece of cake that then results in raised blood sugar levels; what happens upon hearing a sudden loud noise; the effect of exercising on a hot day. Large posters or diagrams could be produced to show the locations of the various sense organs and endocrine glands.

LO2 Understand the structure and function of the sense organs

The structure of those sense organs identified in the content section needs to be understood by the learners. This could be gained through anatomical models in the case of the eye and ear, with the possibility of dissection available to further understand the former. Simple tests to map the distribution of cutaneous nerve endings in the fingertips as opposed to the fore arm or neck could be carried out. The distribution of taste buds on the tongue could be investigated. Learners could also try reading material in Braille or attempt to identify objects by touch alone. They could try to describe the smell of drinks or food or try to identify foods when blindfolded and with their noses held. Images, DVDs could all be used to consolidate knowledge and annotated posters, reports or presentations produced.

LO3 Understand the physiology of the nervous system

Tutor led research will allow learners to identify the components of the nervous system as identified in the contents section and again anatomical models, images and DVDs will allow consolidation. Learners' knowledge needs only to cover a basic organisation of parts and they are not expected to name nerves either cranial or spinal other than perhaps the sciatic so that reference to sciatica can be made. The importance of the cerebral cortex and cerebellum in sensory perception and muscular response needs to be understood and again linked to disorders such as multiple sclerosis and strokes. The use of images based on a representation of the human body where the size of the mouth and hands are in proportion to those areas responsible for them in the brain would be particularly useful as it reinforces the importance of those senses to the human. If practicable a visit to the Natural History Museum and Wellcome Museum of Medicine in London would be beneficial. Local museums or exhibitions may be suitable alternatives. The antagonistic nature of the sympathetic and parasympathetic systems needs to be understood and learners need to be aware that not all sensations and responses are under conscious control. Reference to how humans learn to control their bladders and bowels only with difficulty and how this ability is easily lost under stress or with age will reinforce this section.

Nerve action does not need to be covered in great depth but an understanding of the principles involved and the functions of components such as the myelin sheath, nodes of Ranvier and synapses needs to be achieved. This can be aided by the construction of simple models involving pieces of paper. Models using different colours of electrical wire can also be used to distinguish between nerve fibres and neurons. Nerve transmission can be explained by the use of falling dominoes either carried out in class or watched on media such as You tube where attempts at mattress dominoes can be viewed. This also will help to understand the concept of threshold levels. Reference can be made to individual pain levels or sensitivity to touch, taste and sound. Learners need to understand the nature of the synapse and its importance but detailed knowledge of the various types is not required. The action of painkillers in inhibiting the action of synapses or their stimulation by chemicals such as caffeine could be used to reinforce the principles.

Reflex arcs and speed of nerve transmission could be demonstrated by timing how long it takes to grasp a falling metre rule. Hand eye coordination could be demonstrated by buzzer and wire exercises or by mirror drawing such as tracing between a double star using only a mirror to view progress. As previously suggested, presentation slides, annotated diagrams, models and written work could all be produced to reinforce learning and comprehension.

LO4 Understand the physiology of the endocrine system

In this section learners need to be guided to the internal environment and so follows on from LO1. Knowledge of homeostasis would be useful at this point and it is quite likely that learners will already have met this concept in previously studied units. If not, then a brief introduction or overview would be required. Initially learners would need to be guided to an understanding of the nature of hormones and their action. Examples such as those identified in the contents section could be researched individually or in pairs and fed back to the class. Again annotated diagrams, posters, presentations or even card games that match hormone with function, gland and target organ could be employed to further learning. The concept of feedback mechanisms would need to be understood for the higher grades and examples used to reinforce this. It is important at this stage of delivery to understand the assessment requirements as different forms of endocrine function need to be covered and understood by the learners. One involves homeostasis, the other does not. Learners need to distinguish between regulation of body activities and the body's response to variables. The regulation of body activities could be illustrated with reference to the role of the thyroid gland, thyroxin and metabolic rate or the roles of FSH, LH, oestrogen and progesterone in the menstrual cycle. The body's response to variables could be demonstrated by reference to variations in blood sugar levels and the functions of insulin and glucagon. Alternatively the regulation of calcium levels in the body could be investigated. There are a number of presentations and animations available on the internet that illustrates these principles and examples.

LO5 Understand the effects and management of disorders of the nervous and endocrine

At this stage learners will probably have identified a number of disorders of the sensory, nervous and endocrine systems. This aspect now needs to be covered in depth with learners studying both a disorder of the nervous system and one of the endocrine. The choice is obviously down to either the tutor or the learner and may depend on existing work placements or experiences of the learner's friends and family. Internet websites, textbooks, medical encyclopaedias, support charities, case studies, visiting speakers could all be used to gain knowledge and understanding. Probably the obvious choices would be multiple sclerosis and diabetes as these readily illustrate the knowledge gained by learners in previous sections. Learners need to explore the effects of the chosen conditions on those affected and the various treatments, care strategies and support available. If considering, for example, diabetes the learner would need to understand that not only does this condition affect the endocrine system but also the nervous and sensory systems resulting in potential nerve damage and loss of sensation in the skin together with damage to the retina resulting in loss of vision.

SUGGESTED ASSESSMENT SCENARIOS AND TASK PLUS GUIDANCE ON ASSESSING THE SUGGESTED TASKS

The assessment evidence is likely to be presented as written work with extensive use of annotated diagrams and images. It could be in the form of posters or information leaflets but there would have to be sufficient depth to meet the stem verbs describe and explain. If visual images are used then there must be accompanying descriptions or annotations that will individualise the work.
Although there are six pass criteria it is likely that tutors will guide learners into producing five assignments.

P1 – Could be met by either an annotated poster or by a written report that provides an overview and introduction to the nervous and endocrine systems, the location and function of the identified glands and sense organs and how they work together with the nervous system to bring about coordination. This can then be further evidenced through scenarios, such as those suggested in the guidance, to meet M1. This is likely again to be a written account although it could be an annotated poster as long as there was enough evidence of synthesis. The learner would be expected to provide a detailed account of the interaction between the sense organs that detect external changes, or the internal monitors such as the hypothalamus, and the nervous and endocrine systems that result in a response. It is essential that any chosen examples should illustrate a receptor linked by nerve pathways to an effector that results in an endocrinal response, so demonstrating the integration of all three systems.

P2 – Could be a slide presentation augmented by a written report or a series of posters/information leaflets that sets out to explain the structure of the identified sense organs and how this relates to their function. Detailed physiology is not required as long as there is enough depth to show understanding of any constituent parts.

P3 – Can also be evidenced through the same methods of evidencing as P2 especially for the organisation of the various components of the nervous system and nerve cell structure. Models could be made and photographed or included in a display accompanied by witness statements by tutors authenticating learner's work that could be shown to a visiting moderator. An illustrated written report could be provided to describe nerve action through self produced animations, or video evidence of falling dominoes could be utilised or generated. Write-ups of any relevant practical investigations could also be incorporated. Whilst learners are not being asked at this stage to discuss disorders a brief explanation of the causes and effects of multiple sclerosis could be used to explain the process of nerve transmission and the role of the myelin sheath. An examination of the control of blood pressure or heart rate could be used to explain the antagonistic effects of the sympathetic and parasympathetic systems.

P4 – Could be treated separately or merged into a single assignment with P5. Opportunities would need to be provided to enable learners to meet the criteria for M2 and D1. This could be covered yet again by annotated diagrams, posters, animated presentations or written reports. P4 needs stress on the word *regulation* and could involve an explanation of hormonal involvement in, for example, water regulation, control of the menstrual cycle or the control of either growth or metabolism. It differs from M1 in being about the action of hormones rather than the integration of body systems. It requires the learner to explain the glands and hormones involved and any mechanisms of action.
To achieve M2 the learner needs to explain examples of feedback mechanisms that are involved. This is readily illustrated within the menstrual cycle for example. To attain D1 the learner would need to analyse the importance of hormones in regulating internal activities and could involve the learner investigating why water levels need to be regulated and how the endocrine system is involved or why metabolic rate needs to be controlled and how. Similarly the reasons for the hormonal control of the menstrual cycle could be explored.

P5 – Learners could then move onto P5 either as a continuation of hormonal involvement or as a separate assignment. Here learners need to use two specific examples of how named variables are controlled by the body. As this pass criterion sits within LO4 the expectation is that it will centre on the endocrine system's involvement but other systems could be incorporated. As previously stated blood sugar levels and calcium levels are one option but there are others. This too could be covered by annotated diagrams or slide presentations that include animations as long as there was also continuous prose providing the explanation and witness statements by assessors confirming that the products are the work of the learner.

P6- Requires learners to investigate two disorders- one of the nervous system and the other of the endocrine system. As stated in the guidance section multiple sclerosis and diabetes are obvious choices as they easily reflect the content of the unit and also allow the learner plenty of opportunities to meet the higher grading criteria. However it is down to the tutor and learner to decide. For the pass criterion learners need to explain the treatments and care strategies available to deal with the named disorders. This could be presented as a care pathway, a written report or as a guidance/advice leaflet offered to the family of an affected individual. It is not expected that the learner will go back over detail already covered in earlier assessments.

M3 – Learners are expected to analyse the effects of each disorder on daily lives. This will require quite detailed research into the conditions. If for example a learner chooses diabetes it is not only about any current dietary or lifestyle effects but what may happen as the condition worsens or advances. For example damage to nerves and blood vessels may result in gangrene, amputations and encroaching visual impairment. Long term effects of diabetes can also include strokes and kidney damage. Learners would need to assess how these might affect the ability of an individual to drive or live independently for example.

D2 – Learners need to evaluate treatments, care strategies and support. They might consider the efficacy and side effects of treatments, the availability of care and treatments, cost, demands on time, necessary and possibly difficult lifestyle changes, belief in the value of support groups and complementary therapies. This too could be evidenced as a fact sheet for affected individuals and their families.

SUGGESTED ASSIGNMENTS

The table below shows suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Cambridge Assessment assignments to meet local needs and resources.

Criteria	Assignment title	Scenario	Assessment
P1, M1	An investigation into the body systems responsible for coordination.	The learner is producing a series of displays or information packs for a non-scientific audience possibly with family members affected by disorders of the nervous or sensory or endocrinal systems.	Annotated posters, information packs or slide presentation describing the roles of the systems involved in coordination which may also include a description of how integration is brought about.
P2	The structure and function of human sense organs.		A written report together with illustrations/images that describes the structure of the main sense organs and explains how this relates to their function. Write ups and conclusions from practical investigations may form part of the evidence.
P3	An investigation into the human nervous system and its physiology.		An illustrated written report, annotated posters, animated slide presentations and/ or leaflets that explain the composition, anatomy and physiology of the components of the nerve system.
P4, P5, M2, D1	An exploration of the endocrine system –its importance and mechanisms.		An illustrated written report, annotated posters, animated slide presentations and/ or leaflets that explain the composition of the endocrine system, its roles within the body and its mechanisms of action.

P6, M3, D2	An investigation into a named disorder of the nervous system and a named disorder of the endocrine system.		Two detailed advice packs that examine the causes of two relevant disorders and the possible treatment and care strategies involved in dealing with them. The packs could also include reference to the likely effects on the daily lives of individuals with these disorders and how suitable/available/ effective the care strategies and support would be in meeting the needs of those individuals.

RESOURCES

Text books

Adds J, Larkcom E and Miller R – *Molecules and Cells* (Nelson Thornes, 2003) ISBN 9780748774845

Clancy J and McVicar A – *Physiology and Anatomy: A Homeostatic Approach* (Hodder Arnold, 2002) ISBN 9780340762394

Jenkins M – *Human Physiology and Health* (Hodder and Stoughton, 2000) ISBN 9780340658529

Kent M – *Advanced Biology (Advanced Science)* (Oxford University Press, 2000) ISBN 9780199141951

Mader S – *Understanding Human Anatomy and Physiology* (McGraw, 2004) ISBN 9780071111607

Minett P, Wayne D, Rubenstein D – *Human Form and Function* (Hyman, 1989) ISBN 9780713527148

Seamons S *Applied Health & Social Care: A2 Student Book OCR* (Folens, 2007) ISBN: 1850082480

Smith, Tony ed, *British Medical Association Complete Family Health Guide*, (Dorling Kindersley Ltd 2000) 9780751327229

Stretch B and Whitehouse M – *BTEC Level 3 Nationals in Health and Social Care Student Book 1* (Pearson, 2010) ISBN 9781846907663

Stretch B and Whitehouse M – *BTEC National Health and Social Care Book 2* (Heinemann, 2007) ISBN 9780435499167

Stretch B *A2 GCE Health and Social Care Student Book for OCR* (Heinemann,2006) ISBN 97804353529

Toole A and S – *Understanding Biology for Advanced Level* (Nelson Thornes, 1999) ISBN 9780748739578

Journals

'Inside the human Body' Bright Star Publishing
Biological Science Review
New Scientist
Nursing Times
National Geographic Magazine

Websites

www.bbc.co.uk/schools/gcsebitesize/biology

www.bbc.co.uk/scotland/learning/bitesize/higher/biology

www.biologyguide.net

www.getbodysmart.com

www.educypedia.be/education/anatomyimages.htm

www.nhs.uk/conditions

www.diabetes.org.uk

www.alzheimers.org.uk

www.rnib.org.uk – RNIB offers support and advice to blind and partially sighted people in the UK

www.bda.org.uk – Largest organisation in the UK that is run by deaf people for deaf people

www.ndcs.org.uk – The national charity dedicated to creating a world without barriers for deaf children and young people.

www.mstrust.org.uk – Provides information for anyone affected by multiple sclerosis

DVDs

Inside the Human Body [DVD] (DVD - 2011)
The Human Body [DVD] [1998]

MAPPING WITHIN THE QUALIFICATION TO THE OTHER UNITS

Unit 5: Anatomy and physiology for health and social care

Unit 11: Physiology of fluid balance

CONTACT US

Staff at the OCR Customer Contact Centre are available to take your call between 8am and 5.30pm, Monday to Friday.

We're always happy to answer questions and give advice.

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