



Accredited

**OCR LEVEL 3
CAMBRIDGE TECHNICAL
CERTIFICATE/DIPLOMA IN
HEALTH AND
SOCIAL CARE**

**ANATOMY AND PHYSIOLOGY FOR
HEALTH AND SOCIAL CARE**

R/600/8956

LEVEL 3 UNIT 5

GUIDED LEARNING HOURS: 60

UNIT CREDIT VALUE: 10

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LEVEL 3 UNIT 5

AIM OF THE UNIT

We eat, we breathe, but why? This unit aims to enable learners to understand why these essential processes are so important in maintaining life. In investigating the answers learners will discover the structure and function of not only the cells and tissues involved, but how they form organs and body systems that have to interact to ensure that the body can provide the conditions necessary for thought, movement, growth and development. These systems could so easily spin out of control with disastrous results to our health, and so learners will be able to explore the homeostatic mechanisms that ensure stability of conditions within the body.

PURPOSE OF THE UNIT

Working in the health and social care sector will often involve either giving health advice to individuals or caring for them. Relatives and friends of people with health issues will be 'hungry' for information. This unit will give learners the opportunity to develop a broad understanding of the body, its workings and its organisation and will provide a foundation of applicable knowledge.

Learners will start with a basic knowledge of cellular structure and function, especially concentrating on the role energy has in driving the processes of the body and how this energy is obtained. Learners will examine how certain systems work together in providing the necessary requirements for energy production and removing potentially poisonous by-products from the body.

Whilst certain systems and tissues will be explored in depth from both an anatomical and functional point of view, learners will also be taken on a brief overview of all major organs and systems of the body, not only discovering their location but what they do.

Conditions within the body are constantly changing and this could have lethal effects. Many human dysfunctions that learners may encounter whilst working in the health and social care sector are the result of disturbances of these conditions. Learners will have the opportunity to study how these harmful effects are avoided in the healthy body by homeostatic mechanisms. They will be able to observe some of these regulatory processes in action by undertaking simple practical activities that will require them to take measurements of the cardiovascular and respiratory systems along with body temperature using non-invasive techniques.

This unit will provide a core understanding and knowledge of human anatomy and physiology that will allow progression on to further specialised physiology units. The unit further encourages learners to develop a working comprehension of the body's operations that may well influence the lifestyle decisions they themselves make or the advice and help they give to others.

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 the organisation of the human body	P1 outline the functions of the main cell components		
	P2 outline the structure of the main tissues of the body		
	P3 outline the gross structure of all the main body systems		
2 Understand the functioning of the body systems associated with energy metabolism	P4 explain the physiology of two named body systems in relation to energy metabolism in the body	M1 explain how two body systems interrelate to provide for the body's energy needs	D1 analyse how systems of the body use energy
3 Understand how homeostatic mechanisms operate in the maintenance of an internal environment	P5 explain the concept of homeostasis	M2 explain how the body maintains the optimum conditions for energy metabolism	D2 analyse the consequences of homeostatic processes failing in the body
4 Be able to interpret data obtained from monitoring routine activities with reference to the functioning of healthy body systems	P6 follow guidelines to collect data for heart rate, breathing rate and temperature before and after a standard period of exercise	M3 explain measures taken to ensure validity and reliability during the practical investigation	

TEACHING CONTENT

1 Know the organisation of the human body

- *Organisation:* cells; tissues; organs; systems
- *Cells:* cell membrane, nucleus, chromosomes; cytoplasm; mitochondria; endoplasmic reticulum; ribosomes; Golgi apparatus, lysosome
- *Tissues:* The basic structure and function of:
 - Epithelial: squamous, ciliated, goblet cells
 - Blood: red blood cells, white blood cells, platelets
 - Cartilage and bone
 - Areolar tissue
 - Adipose tissue
 - Striated muscle
 - Sensory and motor neurons.
- *Location of body organs:* heart, lungs, brain and spinal cord, stomach, liver, pancreas, duodenum, ileum, colon, rectum, kidneys, bladder, ovaries/testes, oviducts, uterus.
- *The gross structure of body systems:*
 - cardiovascular - heart, arteries, veins, capillaries;
 - respiratory;
 - digestive;
 - renal;
 - nervous – central nervous system and peripheral nerves;
 - endocrine – thyroid, pituitary, pancreas, adrenals, testes/ovaries;
 - reproductive (both genders);
 - musculoskeletal – a named joint, antagonistic muscles around a named joint,
 - section through a bone
 - skin.

Main functions of systems: Overall function of each system shown above plus those of the lymphatic and immune systems.

2 Understand the functioning of the body systems associated with energy metabolism

- *Energy metabolism:* Role of energy in the body; anabolism and catabolism; the significance of ATP; cellular respiration and its by-products; endothermy of mammals; muscle action; protein synthesis.
- *The roles of the cardiovascular, respiratory and digestive systems in supplying the necessary molecules and in removing by-products:*
 - Cardiovascular system – cardiac cycle, heart rate, role of pacemaker, blood pressure, pulmonary and systemic circulation, formation of tissue fluid
 - Respiratory system – inspiration, expiration, gaseous exchange
 - Digestive system – role in digestion and absorption of nutrients (carbohydrates, proteins, fats and nucleic acids); role of enzymes (amylases, proteases, lipases and nucleases); products of digestion (amino acids, sugars, glycerol and fatty acids, nucleotides), their absorption and subsequent roles in metabolism; the storage of excess fats and carbohydrates; deamination of excess proteins and the fate of end products; roles of the liver and kidneys.

3 Understand how homeostatic mechanisms operate in the maintenance of an internal environment

- *Homeostasis*: definition; the need for a constant internal environment and the consequences of any major disturbances; the concept of negative feedback
- *Homeostatic mechanisms for the regulation of*:
 - Heart rate
 - Blood pressure
 - Breathing rate
 - Body temperature
 - Blood glucose levels
 - Blood concentration levels.

4 Be able to interpret data obtained from monitoring routine activities with reference to the functioning of healthy body systems

- *Measurements*: pulse rate, breathing rate, temperature, blood pressure; normal values and ranges; safe practice and recognition of factors affecting reliability of measurements
- *Normal variation*: resting values, values after exercise, recovery times
 - Data presentation: graphs, charts and interpretations/explanations of collated data.

DELIVERY GUIDANCE

LO1 Learners need to develop an understanding of the human body and how it operates at various levels from cellular to whole body systems. They need to appreciate the basic structure of a generalised cell and the essential functions of the organelles found inside. This work does not require access to science laboratories. Prepared or self-made microscope slides can be used to investigate cell and tissue structure if this is possible. Alternatively, images from slide packs, DVDs, books, websites could be used to illustrate these. Provided images could be identified and annotated by the learners. Models of cells can be made easily using a variety of media – either individually or on a larger scale as a group activity. There could be teacher led research on cell structure and function of cell organelles with group discussion/ Blockbuster quiz/ class mind maps to reinforce knowledge and understanding. The learner can utilise similar resources and cut-out models could be used to identify tissues, body organs and their locations. There are several interactive websites available. Organ structure and system function could be split up amongst the group, allocating pairs of learners to produce charts, annotated diagrams, posters or a slide presentation and then sharing with the group. Collective displays could be made to reinforce learning.

LO2 requires only an overview of cellular respiration providing the learners with an awareness of the role of glucose and oxygen and how its breakdown results in energy release. The use of building bricks held together with adhesive putty could illustrate this. The significance of ATP as the ready form of energy for metabolic processes could be compared to visiting a cash dispenser (respiration) to obtain useable cash (ATP). Detailed biochemical pathways and processes are not required, merely the broad principles. The by-product of some energy as heat needs to be understood and the effect that this has on cell reactions understood especially in relation to enzyme structure and function. These too only require basic coverage to allow the principles of the lock and key mechanism of enzyme action to be understood and the importance of maintaining protein structure. The fact that carbon dioxide is an acidic by-product should be noted and again the implications for body pH and enzyme activity understood. Learners should be encouraged to speculate on what could happen if pH and temperature levels were to exceed optimum values.

Only a basic understanding of protein synthesis is required so that the learners can appreciate why the body needs a supply

of amino acids in the diet and the role of energy in building these up into human proteins using genetic information and ribosomes. Learners could follow the passage of a typical meal that includes carbohydrates, protein, fats and genetic material through the digestive system producing charts or posters to illustrate the fate of the various nutrients. Images of enzymes, food molecules and products can be laid out in sequence to illustrate the various steps. The learners will need to explore how the digestive structures work together to either bring about breakdown or provide a suitable working environment. How the breakdown products are absorbed and the importance of gut villi needs to be emphasised. Discussions, quizzes, mind maps and films can all be used to reinforce understanding of how food is digested and why and how the products are transported to the tissues. The role of the cardiovascular system in getting the products of digestion to the cells can then also be covered using images and films. Similarly how oxygen is brought into the body by the respiratory system and to the cells by the blood and how carbon dioxide is removed.

LO3 The work on cell metabolism will set the scene for a discussion and teacher input on homeostasis and the need to maintain a constant environment. This will link to the functions of body systems previously studied and the control mechanisms identified in the teaching content section. These mechanisms do not need to be explored in depth but in enough detail for the learners to understand the principles. A brief consideration of disorders that may occur when homeostasis breaks down could be used to underscore its significance, for example, diabetes, acidosis, hypo/ hyperthermia, hypertension. The learners could research these in small groups and present back their findings leading to a group discussion on the importance of homeostasis.

LO4 The practical investigation of body temperature, breathing and heart rate will also illustrate this concept. This will not require more than standard observational techniques and readily available equipment. Guidance on safe practice will need to be provided. Standard exercise tests, for example, step test, can be carried out to produce a moderate level of exertion over a suitable period of time. Learners will need to appreciate the importance of replication and accuracy of recording to ensure validity and reliability of results. It is recommended that they take measurements at rest, immediately after exercise and at five minute intervals until readings have returned to pre-exercise levels. If starch iodide paper is available then the learners would also be able to see the position of sweat glands and the role sweat plays in

temperature regulation. The learners will need to make the link between their findings and the systems operating within the body and they should be encouraged to consolidate this through a written report on their investigation which explores the biology behind any changes they have noted. Clinical thermometers will be required. Heart rate may be measured manually or digitally if pulse meters are available. Blood pressure readings do not have to be taken but may be included if the appropriate equipment is available and safe practice in recording is observed.

Interviews with, or talks from, fitness instructors, dieticians, nurses, health visitors and other practitioners with an understanding of body systems may enable learners to visualise the workings of the body and the practical consequences of such knowledge. Medical personnel could also advise on how best to make observations and record data during the practical investigation.

ASSESSMENT GUIDANCE

Assessment is likely to be learning outcome based and written in nature. Display work or posters may be used as evidence, as can photographic evidence. It is advisable to have all evidence to hand when a visit by an external moderator is planned.

P1 – The assessment could be in the form of a written report, a poster or a presentation.

P2 and **P3** – Could be approached as for the assessment of the previous assignment. Pass criteria 1, 2 and 3 all only require an outline and so for both assignments only an overview is required for assessment purposes, thus annotated diagrams and key features will suffice. However it should be noted that all organs, systems, tissues and cell components identified in the Teaching Content section should be covered.

P4 – Learners must explain the workings of **two** systems that are closely involved in the production of energy by the body –logically these can be selected from the digestive, cardiovascular or respiratory systems. The learners need only concentrate on those functions that directly relate to energy production. This is likely to be in the form of a written report. To achieve M1 there must be an obvious attempt by the learner to show how the two systems work together and interrelate in order to ensure energy production and usage occurs. Systems should not be explained separately but their integration made obvious throughout.

D1 – Learners must also analyse the role of energy in the body through the process of cellular respiration; the production and role of ATP and the use of energy via ATP in a variety of named body processes including the use that mammals make of the energy released as heat. There should be evidence of an assessor's justification for awarding higher grades. Work could be annotated where appropriate evidence is located or a proforma produced explaining assessment decisions supported by page references.

P5 – Requires an explanation of the concept of homeostasis. This, too, is likely to be in the form of a written report although annotated posters could be used. P5 requires evidence of an understanding of normal levels, methods of detecting deviations and corrective mechanisms so illustrating the principles of negative feedback. M2 builds on this and is likely to involve describing a couple of examples of how systems may be involved in carrying out this process. This could be linked to the practical investigation relating to

LO4 and would therefore involve an explanation of events occurring in the body during exercise and how this relates to homeostasis as well as energy metabolism. Again assessors need to provide comments that these requirements have been met.

D2 – Learners need to demonstrate that they understand the consequences to the body of not maintaining a constant environment. This is likely to concentrate on the adverse effects of deviations in temperature, pH and glucose levels but could possibly refer to events in the kidney ensuring that water lost through sweating is returned from the urine to the blood. Some broad understanding of the nature of enzymes, their importance in metabolism and their dependence on optimum pH and temperature is expected. This could be assessed by a practical investigation of enzyme activity over a range of either temperature or pH if resources allow or simply by a researched and written report. A study of dysfunctions could be used to illustrate their analysis though this should not be too detailed. Interviews or case studies of people with diabetes, for example, could form part of learner's evidence.

P6 – Involves a practical activity to investigate the effects of exertion on the body. To achieve P6 learners need to have carried out the investigation and collected data. To attain M3 they must explain the measures they took to ensure accuracy. Some attempt must be made to explain how valid and reliable their data is. This assessment could involve interviews with learners as long as the learner's responses are recorded appropriately. Alternatively it could be a written account of their investigation.

The practical investigation will require group work but the assessed evidence must be individual.

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	The structure and functions of a typical human cell.	An exhibition for non science specialists on the components of the human body.	Written report or poster on the structure and function of a typical human cell.
P2	The structure of the main tissues of the body.		Poster or slide presentation on the structure of the main tissues of the body.
P3	The gross structure of the main body systems.		Written report or poster outlining the gross structure and location of the main body systems.
P4, M1, D1	An exploration of how two named body systems provide the necessary requirements for the energy needed by the body.	An explanation to a non-specialist audience/reader on why the body requires energy, how it obtains it and how identified systems function to facilitate this process.	A written report together with illustrations/images.
5P, M2, D2	An investigation into homeostasis and its importance to the human body.	Helping those attending an exercise class understand what is happening in their body during exertion and why, together with the consequences of any breakdown in the control mechanisms.	An illustrated written report.
P6, M3	A practical investigation to the body's response to exercise.		Records of a practical investigation into the effects of exercise on the body including results tables and suitable graphs together with explanations.

RESOURCES

Text books

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

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

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

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

Journals

'*Inside the human Body*' Bright Star Publishing
Biological Science Review
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.educylopedia.be/education/anatomyimages.htm
www.nhs.uk/conditions

DVDs

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

MAPPING WITHIN THE QUALIFICATION TO THE OTHER UNITS

Unit 11: Physiology of fluid balance

Unit 12: Physiological disorders

Unit 16: Nutrition for health and social care

LINKS TO NOS

HSC33 Reflect on and develop your practice

a – reflect on your practice

HSC361 Prepare for, and undertake physiological measurements

a – Prepare environments and resources for use when taking physiological measurements

b – Undertake physiological measurements



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