Unit 21: Biomedical Science

Delivery guidance

Approaching the unit

In this unit, learners will gain a broad introduction to biomedical science. They will be looking at the application of science in some specialised areas of health science. The unit covers some of the main branches of the large and varied discipline of biomedical science. Learners will be introduced to blood science and diagnostic techniques used in haematology. They will also examine how urinalysis is used in assessing health and making diagnoses.

Delivering the learning aims

Learning aim A is about the way the body defends itself against infection. Learners could produce annotated posters to show the different methods of defence and where they take place in the body. Antibody-mediated immunity is complex and learners could include further descriptive annotations and diagrams to exemplify the processes involved.

Learning aim B examines the principles of blood transfusion science. Learners would benefit from a visit to a haematology laboratory or a talk from someone who works in a haematology setting.

Learning aim C investigates the importance of cell pathology as a diagnostic tool. Learners could research case studies to examine the role of the processes involved in specific disorders and then examine and justify why the different methods of cell collection are used in the different case studies.

Learning aim D explores the way the chemical make-up of the body influences health and disease. Learners would benefit from a visit to a medical laboratory or from someone from a medical laboratory coming in to speak about their work investigating metabolic errors and the routine testing and monitoring they carry out.

Assessment model

Learning aim	Key content areas	Recommended assessment approach
A Understand the ways in which the body defends itself against infection	**A1** Methods of non-specific defence used by the human body **A2** Methods of specific defence used by the human body	A report on the defence mechanisms of the human body.
B Examine the principles of blood transfusion science and its importance to those working in haematology	**B1** Blood components **B2** Diseases/ problems associated with blood components **B3** The diagnostic techniques used in haematology **B4** Other techniques used in haematology **B5** Blood transfusion **B6** Transmissible infections by blood transfusion	
C Investigate the importance of cell pathology as a diagnostic tool	**C1** Processes involved in cell pathology **C2** Types of cell collection for analysis	A report, based on individual research, on how biochemical and

D Explore how the chemical make-up of the body influences health and disease	**D1** The biochemistry systems **D2** Biochemical testing and monitoring	pathology tests are used to identify and measure diseases in the human body.

Assessment guidance

This unit is internally assessed. There is a maximum of two summative assignments for this unit. Tutors should refer to the assessment guidance in the specification for specific detail, particularly in relation to the requirements for Pass, Merit and Distinction grades.

It is suggested that **learning aims A and B** are assessed via a written report including annotated diagrams. In the report, learners must describe the specific and non-specific defences of the body, which must be linked to specific examples. The structure and function of blood components could be covered by a series of fully annotated diagrams. The diagnostic techniques described should focus on the actual techniques, not on the analytical equipment used. When learners describe the processes to ensure blood products are safe, they should name some relevant diseases. The role of haematology as a diagnostic tool and in the transfusion process should be covered.

Learning aims C and D could also be covered in a written report. This should link cell injury to the diagnostic tests used, including biochemical tests. Learners could use annotated diagrams and flow charts to explain biochemical systems and link them to the relevant diagnostic tests that monitor their normal functioning. The emphasis of this assessment is on the work of laboratories in diagnosing causes and supporting cures, not on the equipment used to carry out the diagnosis.

Getting started

This gives you a starting place for one way of delivering the unit, based around the recommended assessment approach in the specification.

Introduction
Introduce this unit by discussing the effects of disease on body systems and considering the idea that diagnostic tests are ways in which laboratory scientists look for those effects.
Learning aim A: Understand the ways in which the body defends itself against infection
• Learning aim A is about how the body defends itself against infection. • For A1 and A2, learners could research the methods of specific and non-specific defence. They could then use research to produce annotated posters to share with the rest of the group.
Learning aim B: Examine the principles of blood transfusion science and its importance to those working in haematology
• Learning aim B is about blood transfusion science. Learners would benefit from a visit to a haematology laboratory and the blood transfusion service. If this is not possible, tutors could ask relevant services if someone could come into the centre and talk to students about the services they provide. • For B1 and B2, learners could research and produce annotated diagrams of the structure and function of blood and include the disease and problems associated with the different components. • For B3 and B4, learners could carry out practical techniques in the laboratory. Blood smear plates are available commercially, and blood cell counts, iron deficiency tests etc that are practical and allowed by local policies and legislation. • For B5 and B6, learners could produce annotated timelines showing the production of blood products, their clinical uses and the prevention of transmissible infections.
Learning aim C: Investigate the importance of cell pathology as a diagnostic tool
• For C1 and C2, learners could research the different causes of cell injury, then link those to the types of cell collection that are used to analyse that injury.

Learning aim D: Explore how the chemical make-up of the body influences health and disease
• Learning aim D is an exploration of the chemical make-up of the body and its influence on health and disease. Learners would benefit from the opportunity to visit a biochemical laboratory, or from a visit by a biochemical scientist to talk about the different testing techniques they use. • For D1 and D2, learners could research the different biochemical systems and then link them to the relevant testing and monitoring regimes. If the size of the group allows, the systems could be spread among different groups, who then feed back to the whole group, ensuring all the tests and systems are covered.

Details of links to other BTEC units and qualifications, and to other relevant units/qualifications

This unit links to:

- Unit 2: Anatomy and Physiology for Health and Social Care
- Unit 11: Scientific Techniques for Health Science
- Unit 12: Physiological Disorders and their Care
- Unit 13: Microbiology for Health Science
- Unit 19: Medical Physics Applications in the Health Sector
- Unit 22: Biochemistry for Health.

Resources

Textbooks

Hoffbrand A V and Moss P A H – *Hoffbrand's Essential Haematology* (Wiley-Blackwell, 2015) ISBN 9781118408674
An introduction to the formation and function of blood cells and diseases that arise from dysfunction and disruption of these processes. Basic science, diagnostic tests and clinical features are all easily explained.

Howard M R and Hamilton P J – *Haematology: An Illustrated Colour Text* (Churchill Livingstone, 2013) ISBN 9780702051395
A reference book for tutors and learners.

Iles R and Docherty S (eds) – *Biomedical Sciences: Essential Laboratory Medicine* (Wiley-Blackwell, 2012) ISBN 9780470997758
Coverage of all the major topics for this unit.

Luxton R – *Clinical Biochemistry*, 2nd edition (Scion Publishing Ltd, 2008) ISBN 9781904842415
A focus on the areas of body function required for the maintenance of health.

Ramakrishnan S – *Manual of Medical Laboratory Techniques* (Jaypee Brothers Medical Publishers, 2012) ISBN 9789350256343
A complete guide to medical laboratory techniques used in medical microbiology, haematology, clinical biochemistry, histopathology, human genetics and molecular biology.

Tortora G J and Derrickson B H – *Principles of Anatomy and Physiology* (John Wiley & Sons, 2017) ISBN 9781119400066
Well-known title covering in detail all the information required for human biology – a standard reference book for learners.

Journals

PubMed
https://www.ncbi.nlm.nih.gov/pubmed
A search engine containing biomedical literature from MEDLINE, life science journals and online books.

ScienceDirect
www.sciencedirect.com
A search engine for peer-reviewed journals, articles and books related to science, including health science.

The National Institute for Health and Care Research (NIHR)
www.nihr.ac.uk/
Open access journals providing an archive of research funded by the National Institute for Health and Care Research.

Websites

American Cancer Society website
www.cancer.org
Information about types of cytology tests used to look for cancer.

Cellular Pathology Services
http://cellularpathologyservices.co.uk/
Information about the microscopic examination of cells in body fluids.

General Medical Council
www.gmc-uk.org/
Information about the General Medical Council and the role it plays in health science.

Healthline
www.healthline.com
Search for information about urinalysis.

Lab Tests Online
https://labtestsonline.org.uk/
Information about laboratory tests including how the tests are performed, the normal range of results and what abnormal results could indicate.

NHS
www.nhs.uk
Search for information about blood tests.

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