

CAMBRIDGE TECHNICALS LEVEL 3 (2016)

Moderators' report

# APPLIED SCIENCE

05847–05849, 05879, 05874

**Summer 2023 series**

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## Introduction

Our Lead Moderators' reports are produced to offer constructive feedback on centres' assessment of moderated work, based on what has been observed by the moderation team. These reports include a general commentary of accuracy of internal assessment judgements; identify good practice in relation to evidence collation and presentation and comments on the quality of centre assessment decisions against individual Learning Objectives. This report also highlights areas where requirements have been misinterpreted and provides guidance to centre assessors on requirements for accessing higher mark bands. Where appropriate, the report will also signpost to other sources of information that centre assessors will find helpful.

OCR completes moderation of centre-assessed work in order to quality assure the internal assessment judgements made by assessors within a centre. Where OCR cannot confirm the centre's marks, we may adjust them in order to align them to the national standard. Any adjustments to centre marks are detailed on the Moderation Adjustments report, which can be downloaded from OCR Interchange when results are issued. Centres should also refer to their individual centre report provided after moderation has been completed. In combination, these centre-specific documents and this overall report should help to support centres' internal assessment and moderation practice for future series.

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## General overview

Centres ensured claims for units were submitted on OCR Interchange before the moderation visit with the initials of the assessor who assessed the candidate's work included where relevant. Centre assessors are now only submitting whole units when making a claim on OCR Interchange and realise that they do not need to make a claim when the whole cohort have completed but are submitting when the candidate is ready.

The most common cause of centres not passing is if centres are over generous in their application of the marking criteria; at moderation their grades may be adjusted to reflect this. This tends to happen when the centre's internal standardisation process is ineffective. OCR has an internal standardisation generic guide on their website which promotes good practice.

Most centres ensured the URS sheets were accurately completed. However, not all candidates page numbered their portfolios so when the assessor completed the URS sheet, they could not enter the page numbers for the different criteria onto the URS. This in turn hampers moderation as specific evidence is not easily located. Unit page numbering on the URS becomes more important when units are combined as a project. Cross unit projects are being seen more often as assessors are aware of cross unit linkage. Within each unit specification, unit linkage is indicated within a table.

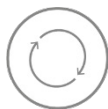
Most assessor comments on the URS were personal to the candidate's quality of evidence. However in a few cases, comments were just a repeat of the criteria.

The assessors should annotate the appropriate evidence in the portfolios. This guidance will indicate if the candidate has achieved the relevant grade criteria. If not, this feedback will indicate to the candidate that the evidence is either missing or needs to be improved. It also helps the moderator if the grades for the various learning outcomes are indicated on the portfolios at the appropriate place.

Verbal presentation by candidates would be useful especially when carrying out investigations and discussions. A witness statement giving exactly the competences displayed by the candidate would evidence this. Again witnessed audit trails of candidates' online interactive activities could be used to show the breadth and depth of candidates' competence.

All research was well referenced throughout by candidates.

### Avoiding potential malpractice



Malpractice in internal units is usually seen as plagiarism which is '*unacknowledged copying from or reproduction of published sources or incomplete referencing*'.

Mostly plagiarism occurs when candidates copy and paste from the internet but it can occur when work is copied from previously submitted assessments by other candidates.

As a teacher you must confirm that the work produced is solely that of the candidate concerned. You must not accept work which is not the candidate's own.

Candidates' results for the externally assessed Unit 2 tend to be higher if candidates have carried out the relevant practical experiments before sitting the external exam. It is recommended that candidates maintain an experimental logbook for Unit 2 and Unit 3 as not only will it help candidates in external exams but it can be used to support grading in the internal units.

OCR provides on their website: delivery guides; project delivery approaches, teaching activities, teacher guides and resource lists. There are also model assignments provided by OCR which can be used directly or modified to suit the local environment. However, centres can create their own assignments but they must allow the candidate to achieve all grade criteria specified for the relevant unit. Centres do not have to set the same assignment for every candidate in the cohort. You can also cover more than one unit in an assignment.

OCR has a range of support for centres, this includes an assignment checking service as well as advisory support including entry and assessment administration; qualification structure; assessment methods.

## Comments on individual units

### Unit 4 – Human physiology

Centres have a good understanding of this unit. A wide range of formats were used in the presentation of evidence.

For LO1, candidates had a sound understanding of the organs that make up the digestive system and how they help food to be digested and absorbed. Candidates enhanced their information with relevant images. They were able to explain the symptoms of common disorders related to digestive system and give a simple diagnosis if a patient presented symptoms.

Candidates tended to present evidence within a PowerPoint presentation so that it was concise but detailed.

For LO2, candidates had a good understand the role of the musculoskeletal system in maintaining the structure and movement of the body and were able to explain the importance of the role of bone marrow to both the skeletal and immune system.

Candidates tended to present evidence within a PowerPoint presentation so that it was concise but detailed.

For LO3, candidates were able to take and record basic cardiovascular measurements. In a number of cases photographs of the candidates and witness statements supported the evidence of the competence of the candidate.

For LO4, to show the practical nature of the learning objective, centres presented evidence for taking measurements related to the respiratory system in a number of ways such as a sequence of photographs, storyboarding or a PowerPoint presentation.

For LO5, centres tended to produce a straightforward “texted” approach on why it is important to regulate body fluids. However this was balanced by the wide range of evidence formats used throughout the whole unit.

For LO6, candidates used detailed examples to explain how the immune system functions when a vaccine is administered thereby preventing infection by certain diseases.

## Misconception



There is a misconception that coronary heart disease is only linked to a poor diet. However, as with many lifestyle diseases, it is multifactorial in its cause. Smoking, a sedentary lifestyle with a lack of exercise and certain genetic factors combine to increase the risk of CHD.

## Unit 5 – Genetics

Centres had a good understanding of this unit. A limited range of evidence formats such as text and images tended to be used

For LO1, candidates were able to describe and explain of the importance of the process of meiosis in inheritance using extended prose to provide sufficient detail to cover the requirements of the assessment criteria.

For LO2, candidates discussed the relationship between genotypes and phenotypes at a molecular and biochemical levels. They were able to demonstrate the chi-squared test ( $\chi^2$ -squared test) to compare expected and observed progeny in a cross.

Candidates were able to identify epistasis and were aware that with advances in DNA sequencing and having produced genomes for many species, it is now possible to produce physical maps of the genome.

For LO3, candidates were able to give good descriptions of the principles and advantages of DNA sequencing and the principles of genetic profiling. Candidates could evaluate the significance and limitations of genetic profiling techniques.

For LO4, candidates could assess the impact and implications of a DNA sequencing project and its impact, such as the Human Genome Project and then produce a report in terms the public will understand.

## Unit 6 – Control of hazards in the laboratory

Centres have a good understanding of the requirements of this unit but did not always recognise the overall aim of the units so the evidence tended to be compartmentalised.

For LO3, an initial introduction examining the different level of containment laboratory might enhance candidates' approach to compiling evidence. Candidates' experience of science laboratories that has been limited to a centre laboratory can be enhanced by the use of video in OCR's Sanger Project. This will allow candidates to "visit/see/experience" a range of bio-laboratories.

This will also link to information provided by the A.S.E. as well as relevant health and safety legislation affecting the control of diseases in a laboratory.

Some candidates' laboratory designs varied with some tending to be general and lack detail as well as explanation. The types of material used could have been included; there needs to be more detail of the materials that would be used for the furniture, flooring, work benches, etc. and how the design could minimise risks.

Others were more detailed, as a scenario had been set so the laboratory was designed with a specific purpose.

It is best that candidates decide on a specific containment level laboratory to design

For LO2, a risk assessment is required for a laboratory procedure. Candidates should be aware of how risk is determined.

When evaluating the effectiveness of current legislation and procedures for D1 and D2, candidates could analyse data from infection in various types of laboratory rather than use examples outside of the laboratory.

Candidates do not always realise the detail required for a Level 3 qualification evaluation.

An approach might be research the accident incidents before 2011 (regulation change due to the Pirbright foot and mouth incident) and those after. Candidates could use examples to support their evidence.

For P2 develop the approach to risk assessing so that it could be applied to a broad range of circumstance i.e. COSHH 5 Steps to risk assessment; hierarchical approach to eliminating and controlling risk so candidates could assess risk in any situation.

Candidates need to broaden the range of risk assessments to disposal of waste and the actual chemicals used. Candidates might view a procedure following good practice and another following bad. Notice simple things such as space/set up of equipment so it is safe and easy to reach as well as "protecting" the environment. This should introduce candidates to real life bio-hazard level laboratories.

Make sure the risk assessments are carried out using a formal risk assessment document which is then checked and signed off.

For LO1, candidates will need to know how organisms cause disease and how pathogens are transmitted to be able to reduce risks in a laboratory as well as to categorise hazard substances.

For M1 expand the detail of the transmission of pathogens; this could be done with examples which in turn will give candidates a broader understanding for possible situations in the future.

## Assessment for learning



Make sure assessment of P4 evidence includes comments relating to the design specification of the equipment/materials used in construction to control risks i.e. does the candidate's design control risks which then leads onto procedures needed to reduce risks.

For D3 by listing containment control regulations and control of diseases in a laboratory the relevant legislation will introduce candidates to the idea that in most career situations there are relevant regulations and legislation.



## Assessment for learning



A risk assessment is simply a means of determining the risk associated with work with a particular hazard. In the workplace, this is most often broken down into five steps.

The methods chosen to control the risks identified by the risk assessment should follow the hierarchical approach which is common to both MHSWR and COSHH.

Candidates should consider how laboratory acquired Infections can be prevented as well as the legislation and guidance for working with biological agents and how it influences procedures and practices.

## Unit 7 – Nutrition

Centres have a very good understanding of this unit and used a wide variety of formats when presenting evidence.

For LO1, candidates had a sound understanding of the components of a healthy balanced diet and produced a variety of formats that would appeal to the public.

For LO2, candidates understood that energy expenditure is the sum of the basal metabolic rate, the thermic effect of food and the energy expended in physical activity. That metabolic processes require energy and the minimum amount of energy your body requires to carry out these chemical processes is called the basal metabolic rate (BMR).

Both practical investigations finding energy content of a carbohydrate food and calculating the BMR of groups of people was supported by tabulated results, photographs of candidates undertaking investigations and witness statements.

For LO3, candidates produced a wide range evidence and detailed examples of conditions relating to dietary needs.

A number of candidates produced booklets and leaflets targeting the public which demonstrated a detailed and sympathetic understanding of the subject.

D1 required candidates to recommend and justify nutritional requirements for a specific group of people; some candidates drew on their understanding of prior criteria and created a summary based on it.

For LO4, a number of centres approached this as a practical investigative activity collecting, analysing, and then evaluating food labelling. Some centres also produced and justified labelling for a food product that targeted a specific group of people, which summaries the whole unit.

## Misconception



There is a misconception that vegetarian diets are always healthier - a vegetarian who eats lots of cheese and eggs is still consuming substantial amounts of fats would actually have a less healthy diet than someone whose diet is based on fish and chicken.

## Unit 8 – Cell biology

Those centres that presented Unit 8 had a good understanding of this Unit. A limited range of evidence formats such as text and images tended to be used.

For LO1, centres tended to produce evidence in the form of a PowerPoint presentation which focused on biological membranes, how they are involved in the movement of substances into and out of the cell, and the role of endomembrane systems. Candidates were able to explain how different types of cell chemical and electrical signalling systems work in the human body and how it might become defective.

For LO2, candidates used photographs and labelled images to demonstrate that they could carry out cell staining techniques, and the use of a haemocytometer and oil immersion microscopy. This was supported by witness statements as to the competency of the candidate's skill.

For LO3, candidates used a text format to describe and explain the stages of mitosis and cytokinesis, and if mitosis did not proceed properly.

For LO4, candidates used a text format in describing the process of cellular differentiation and how genes are involved in this process. Again using text candidates explained the use, and potential use of stem cells in medicine, explaining the techniques used in the collection and culture of stem cells and how they are then used in stem cell therapies.

## Unit 10 – Testing consumer products

Centres carried out the practical investigations within the unit very well.

For LO1, candidates should consider carefully which product they research to be able to obtain information so as to fully cover the grade criteria. They will need to appreciate how Regulation affects the quality imposed on their product.

For LO2, when candidates consider the tests in P2 they should consider the sensitivity, accuracy and reliability of each test; then this would link into M2 as well as support the development of regulations in LO1.

For LO3, in D1 some candidates linked the results in M3 to establish the comparison of results. Again candidates can link to P2 (test selected) when considering the accuracy of their results. It is expected that a range of titrimetric techniques are used by the candidate.

Candidates should look carefully at using correct science in the evaluations and should also include comments on the validity and reliability of the investigation, as well as how it could be improved.

For LO4, candidates carried out the investigations well with good supporting results. Centres should always carry out risk assessments before carrying out practical activities and be aware of chemicals that are not suitable for use in a centre laboratory.

For LO5, centres used a range of products from biological washing powder to antimicrobial solutions to test for their effectiveness.

## Assessment for learning



The approach should be that all measurements and observations should be recorded, in tabular form where appropriate. Measurements should be recorded to the degree of accuracy of the equipment used with candidates should be careful in the use of significant figures and decimal places with the evaluations needing to have depth with a reasoned opinion based on the evidence collected.

## Unit 13 – Environmental surveying

A number of centres combine these units (unit 13 and unit 14) into a “project” based around an environmental practical investigation where an environmental survey results supported both units.

The environmental investigation could be supported by the Environmental Model Assignment from Unit 6 which highlights the risks of fieldwork and how those risks can be minimised.

For LO1, candidates by giving examples which were exemplified with images were able to describe the impact of both human activities and natural events on the environment and how a human activity has impacted on the environment.

For LO2, candidates carried out an environmental impact assessment on a local area such as a local park or riverbank.

For LO3 and LO4, candidates explained how they would collect and analyse environmental data from soil and water and then carried out tests such as pH, mineral content, microorganisms.

For LO4, candidates presented outcomes from their environmental investigations and recommending actions to maintain a positive effect on the environment. Presentations tended to be a PowerPoint.

## Misconception



‘All human activities are harmful to the environment’ - while there are many examples of environmental harm due to human activities, there are cases where the reverse is true, with environments either being preserved against harm, or restored after either natural events or damage due to human activity.

## Unit 14 – Environmental management

A number of centres combine these units (unit 13 and unit 14) into a “project” based around an environmental practical investigation where an environmental survey results supported both units.

The environmental investigation could be supported by the Environmental Model Assignment from Unit 6 which highlights the risks of fieldwork and how those risks can be minimised.

For LO1, candidates compared the environmental characteristics of a natural environment to a built up environment. These tended to be areas near to the centre such as a park and town centre. They went on and presented their comparisons usually in the form of a leaflet.

For LO2, candidates carried out an environmental investigation, collecting data relevant to pollution control and producing a relevant analysis. This activity was linked to Unit 13.

For LO3, candidates produced PowerPoints outlining environmental regulations on the areas that they had investigated which were mainly parks and town centres.

For LO4, candidates evaluated the techniques these used when collecting and analysing environmental data commenting on reliability and precision.

For LO5, candidates used their evaluations of the evidence and techniques from LO4 to produce a presentation, usually a PowerPoint that gave conclusions and recommendations on the areas that they had investigated.

## Unit 18 – Microbiology

Centres have a good understanding of this unit.

For LO1, centres tended to give detailed descriptions with downloaded images, but candidates did not always give a size or magnification of the images. A few centres approached the learning objective with a more practical approach where candidates were given a range of slides of microorganisms which they identified giving an analysis of their findings. This was linked to Unit 2 LO4 [Be able to examine and record features of biological samples] with candidates recording relevant data and making biological drawings while using a microscope. This approach gave a greater “hands-on” scientific approach as candidates would be using Gram Staining and DNA extraction methods.

For LO2, candidates gave good descriptions of the use of microorganisms in agriculture but their evaluation of the consequences of the introduction of GM crops tended to be weak in detail and quantitative data. Their approach might be that they have to: “convince a group to their held belief”.

For LO3, candidates gave a general overview of the four industries given in the specifications.

Centres produced a range of food products however some foods allowed a greater depth of knowledge to be shown. This was reflected in M4 with some candidates giving little evidence for biochemical processes. Candidates should test their product to see if optimum conditions have been met.

For LO4, centres were able to give detailed evidence supported with images and the use of case studies to broaden their evidence with summaries from The World Health Organisation, England, the Health and Social Care Act 2008 Code of Practice. The distinction level candidate was able to support their evidence with quantitative data and trends supported by graphical evidence.

### Assessment for learning



For LO1, the information should be sufficient for a second person to be able to identify an unknown microorganism.

## Unit 21 – Product testing techniques

Centres carried out the practical investigations within the unit very well.

Some centres linked activities across units to produce a project approach; linking testing practicals in Unit 21 to production in unit 18. Also the laboratory logbooks used by centres in Unit 2 linking to the other units in the qualification displayed a great understanding of a "real" scientific approach to learning.

For LO1, candidates should consider carefully which product they research to be able to obtain information so as to fully cover the grade criteria. They will need to appreciate how Regulation affects the quality imposed on their product.

For LO2, when candidates consider the tests in P2 if they should consider the sensitivity, accuracy, and reliability of each test then this would link into M2 as well as support the development of regulations in LO1. Some candidates' evidence for M2 explains how the effectiveness of consumer product evidence is established was weak.

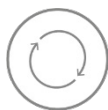
For LO3, in D1 some candidates linked the results in M3 to establish the comparison of results. Again candidates can link to P2 (test selected) when considering the accuracy of their results. It is expected that a range of titrimetric techniques are used by the candidate.

The approach should be that all measurements and observations should be recorded, in tabular form where appropriate. Measurements should be recorded to the degree of accuracy of the equipment used with candidates should be careful in the use of significant figures and decimal places with the evaluations needing to have depth with a reasoned opinion based on the evidence collected.

Candidates should look carefully at using correct science in the evaluations; some were lacking in detail and did not really show enough understanding. The evaluations should also include comments on the validity and reliability of the investigation as well as how it could be improved.

For LO4, candidates carried out the investigations well with good supporting results.

### Assessment for learning



Centres should always carry out risk assessments before carrying out practical activities and be aware of chemicals that are not suitable for use in a centre laboratory.

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