

Cambridge TECHNICALS LEVEL 3

APPLIED SCIENCE

Cambridge
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Unit 10

Testing consumer products

F/507/6157

Guided learning hours: 60

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Essential resources required for this unit: A functioning laboratory for purposes of carrying out titrations etc.

This unit is internally assessed and externally moderated by OCR.

UNIT AIM

This unit introduces you to regulations governing the nature of consumer products and testing methods used in commercial laboratories. The 'consumer' in this unit is defined as the next purchaser in the chain not necessarily a member of the public buying a product in a shop.

The 'product' can also apply to results gathered as part of a survey and therefore the results themselves are the product with recommendations made to the relevant audience for example an environmental audit carried out on behalf of a land owner, the product in this case are the findings and conclusions drawn from the audit presented to the land owner.

In this unit, you will have the opportunity of using the knowledge and skills you have gained in the mandatory units 1 'Science Fundamentals', unit 2 'Laboratory Techniques' and unit 3 'Scientific analysis and reporting'. You will use a range of laboratory techniques in your investigations from inception, through to testing products. You will analyse both the results gathered from your testing and evaluate your experimental technique making adaptations where necessary to ensure quality of data.

TEACHING CONTENT

The teaching content in every unit states what has to be taught to ensure that learners are able to access the highest grades.

Anything which follows an i.e. details what must be taught as part of that area of content. Anything which follows an e.g. is illustrative, it should be noted that where e.g. is used, learners must know and be able to apply relevant examples in their work, although these do not need to be the same ones specified in the unit content.

For internally assessed units you need to ensure that any assignments you create, or any modifications you make to an assignment, do not expect the learner to do more than they have been taught, but must enable them to access the full range of grades as described in the grading criteria.

Learning outcomes	Teaching content
The Learner will:	Learners must be taught:
<p>1 Understand the influence of regulatory bodies on development of consumer products</p>	<p>1.1 The relevant governing bodies that oversee product safety for manufacturers and consumers of products, i.e.:</p> <ul style="list-style-type: none"> • UK Government (e.g. Department for Business, Innovation and Skills (BIS); Department for Environment, Food & Rural Affairs (DEFRA); Department of Health). • Medicines & Healthcare Products Regulatory Agency (MHRA) • Good Laboratory Practice (GLP) for safety tests on chemicals • Trading Standards • Food Standards Agency (FSA) • Association of the British Pharmaceutical Industry (ABPI) • Food and Drug Administration (FDA) in USA. <p>1.2 How governing bodies influence how quality control is applied.</p>
<p>2 Understand how product testing determines the development of consumer products</p>	<p>2.1 Types of testing i.e.:</p> <ul style="list-style-type: none"> • in-vitro • in-vivo • titration • extraction and separation <p>2.2 Laboratory testing during development i.e.:</p> <ul style="list-style-type: none"> • formulation • production • quality control and assurance • after sale monitoring. <p>2.3 Effectiveness of test i.e.:</p> <ul style="list-style-type: none"> • Appropriate test method • Data collection validity and reliability • Consistent chemical composition • Hazards and risks of use (e.g. toxicity, possible mutagenic and teratogenic effects, microbiological safety)

Learning outcomes		Teaching content
The Learner will:		Learners must be taught:
3	Be able to use quantitative titration techniques on consumer products	3.1 Titration techniques on consumer products i.e.: <ul style="list-style-type: none"> • acid-base titration (e.g. limescale removers, eco-disinfectants) • precipitation titration (e.g. contact lens saline solution) • redox titration, e.g. bleach, tooth whitener; vitamin C tablets). • complexometric titrations (e.g. Milk of Magnesia)
4	Be able to use extraction and separation techniques on consumer products	4.1 Solvent extraction techniques <ul style="list-style-type: none"> • Solvent extraction of the active ingredients of consumer products so the mass of the ingredients can be measured (e.g. caffeine, fizzy drinks, shampoos) 4.2 Chromatographic techniques <ul style="list-style-type: none"> • thin-layer chromatography(TLC) (e.g.: food colours, inks, cosmetics) • Rf values 4.3 Micro-analytical techniques that have greater sensitivity <ul style="list-style-type: none"> • high-performance liquid chromatography • gas chromatography (GC) • inductively-coupled plasma techniques (ICP) • mass spectrometry (MS)
5	Be able to test the effectiveness of consumer product tests	5.1 Data analysis i.e.: <ul style="list-style-type: none"> • statistical tests and methods depending on type and scope of data • record results in an appropriate format • experimental uncertainties (e.g. systematic and random, assessing and combining) • use of significant figures (e.g. in measurement, in calculations) • graphical methods <ul style="list-style-type: none"> ○ types of plot (pie chart, bar chart, scatter plot) ○ choice of plot to best present/interpret data 5.2 Conclusions and evaluation i.e.: <ul style="list-style-type: none"> • patterns, trends • unexpected results • strengths • areas for improvement • recommendations for further research

GRADING CRITERIA

LO	Pass	Merit	Distinction
	The assessment criteria are the Pass requirements for this unit.	To achieve a Merit the evidence must show that, in addition to the Pass criteria, the candidate is able to:	To achieve a Distinction the evidence must show that, in addition to the pass and merit criteria, the candidate is able to:
1. Understand the influence of regulatory bodies on development of consumer products	*P1: Describe the requirements of the relevant governing body on the development of consumer product	M1: Explain how governing bodies influence quality control	
2. Understand how product testing determines the development of consumer products	*P2: Select tests to be used in product development	M2: Explain how the effectiveness of consumer product testing is established	
	*P3: Outline procedures used during formulation, production, quality control and after sale monitoring		
3. Be able to use quantitative titration techniques on consumer products	*P4: Use titrimetric techniques on consumer products	M3: Determine the concentration of substances in consumer products using quantitative methods	
4. Be able to use extraction and separation techniques on consumer products	*P5: Use solvent extraction to separate and determine the mass of the active ingredient of a consumer product		
	*P6: Use TLC to investigate qualitatively the composition of a consumer product	M4: Calculate R _f values of constituents of the consumer product to provide quantitative information of a consumer product	
5. Be able to test the effectiveness of consumer product tests	*P7: Carry out data analysis on consumer products	M5: Report on data analysis from consumer product testing	D1: Analyse and evaluate the effectiveness of consumer product testing

ASSESSMENT GUIDANCE

We would expect learners to produce a lab book which show the application to record regulations that apply, tests selected, record results and draw conclusions from the tests the learner has carried out.

LO1 - P1, M1: Evidence must include reference to the regulations or legislation relevant to the testing technique and the product.

LO2 - P2, P3, M2: Describe in the lab book the test and the procedures to be followed. For M1 this is about how the effectiveness of the test has been established. The learner might consider, for example, whether the results were as expected, whether anything affected the validity and reliability of results during testing.

LO3 – P4, M3: Carry out a titrimetric investigation of a consumer product to determine the concentration of different substances that it contains and record the findings.

LO4 - P5: Learners should use solvent extraction to separate and determine the mass of the active ingredient of a consumer product and record the findings.

P6, M4: Use TLC to investigate qualitatively the composition of a consumer product and by measuring the R_f values of the constituents identify them.

LO5 – P7, M5, D1: Learners could investigate the effectiveness of a range of antimicrobials giving a quantitative evaluation of their effect, considering the concentration, duration and types of bacteria under investigation. Learners should consider alternative chemical analytical techniques and evaluate the use of chemical analytical techniques in consumer product testing.

Feedback to learners: you can discuss work-in-progress towards summative assessment with learners to make sure it's being done in a planned and timely manner. It also provides an opportunity for you to check the authenticity of the work. You must intervene if you feel there's a health and safety risk.

Learners should use their own words when producing evidence of their knowledge and understanding. When learners use their own words it reduces the possibility of learners' work being identified as plagiarised. If a learner does use someone else's words and ideas in their work, they must acknowledge it, and this is done through referencing. Just quoting and referencing someone else's work will not show that the learner knows or understands it. It has to be clear in the work how the learner is using the material they have referenced to inform their thoughts, ideas or conclusions.

For more information about internal assessment, including feedback, authentication and plagiarism, see the centre handbook. Information about how to reference is in the OCR Guide to Referencing available on our website: <http://www.ocr.org.uk/i-want-to/skills-guides/>.

*SYNOPTIC ASSESSMENT

When learners are taking an assessment task, or series of tasks, for this unit they will have opportunities to draw on relevant, appropriate knowledge, understanding and skills that they will have developed through other units. We've identified those opportunities in the grading criteria (shown with an asterisk) and provided more detail in the assessment guidance. Learners should be encouraged to consider for themselves which skills/knowledge/understanding are most relevant to apply where we have placed an asterisk.

*During the assessment of this unit, learners will benefit from using learning from the following units and Learning Outcomes:

Name of other unit and related LO	This unit:
<p>Unit 1 Science fundamentals</p> <p>LO1 Understand the chemical structures of elements and compounds</p> <p>LO4 Understand the principles of carbon chemistry</p> <p>LO5 Understand the importance of inorganic chemistry in living systems</p>	<p>LO1 Understand the influence of regulatory bodies on development of consumer products (P1)</p> <p>LO4 Be able to use extraction and separation techniques on consumer products (P5, P6)</p> <p>LO5 Be able to test the effectiveness of consumer product tests (P7)</p>
<p>Unit 2 Laboratory techniques</p> <p>LO1 Understand the importance of health and safety and quality systems to industry</p> <p>LO2 Be able to separate, identify and quantify the amount of substances present in a mixture</p> <p>LO3 Be able to determine the concentration of an acid or base using titration</p>	<p>LO1 Understand the influence of regulatory bodies on development of consumer products (P1)</p> <p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p> <p>LO3 Be able to use quantitative titration techniques on consumer products (P4)</p>
<p>Unit 3 Scientific analysis and reporting</p> <p>LO1 Be able to use mathematical techniques to analyse data</p> <p>LO2 Be able to use graphical techniques to analyse data</p> <p>LO4 Be able to analyse and evaluate the quality of data</p> <p>LO5 Be able to draw justified conclusions from data</p> <p>LO6 Be able to use modified, extended or combined laboratory techniques in analytical procedures</p> <p>LO7 Be able to record, report on and review scientific analyses</p>	<p>LO1 Understand the influence of regulatory bodies on development of consumer products (P1)</p> <p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p> <p>LO5 Be able to test the effectiveness of consumer product tests (P7)</p>
<p>Unit 4 Human physiology</p> <p>LO1. Be able to assess how the cardiovascular system functions in the body</p> <p>LO2. Be able to assess how the respiratory system functions in the body</p>	<p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p>

Name of other unit and related LO	This unit:
<p>Unit 5 Genetics</p> <p>LO2 Be able to apply techniques used in genetics crosses</p>	<p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p> <p>Learners will use theoretical testing techniques such as the use of Punnett Squares to work out probable geno and phenotypic outcomes</p>
<p>Unit 6 Control of hazards in the laboratory</p> <p>LO1 Understand the types of hazard that may be encountered in a laboratory</p> <p>LO2 Be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory</p>	<p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p> <p>LO3 Be able to use quantitative titration techniques on consumer products (P4)</p> <p>LO4 Be able to use extraction and separation techniques on consumer products (P5, P6)</p>
<p>Unit 7 Human nutrition</p> <p>LO2 Be able to calculate nutritional requirements to maintain energy for different levels of activity</p> <p>LO4 Be able to label food with nutritional information</p>	<p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p>
<p>Unit 8 Cell biology (Human science pathway only)</p> <p>LO2 Be able to use key cytological techniques</p>	<p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p> <p>Learners will use microscopy techniques to examine samples (may be pre-prepared) taken from humans who may have been part of a sampled group for a particular activity or condition</p>
<p>Unit 11 Drug development (Human science pathway only)</p> <p>LO2 Understand the range of techniques used in drug production and screening</p> <p>LO3 Be able to carry out a basic extraction, synthesis, isolation and purification of a simple drug or pharmaceutical</p> <p>LO4 Understand the importance of product formulation and dosage form</p> <p>LO5 Understand the importance of planning clinical trials when introducing new drugs</p>	<p>LO1 Understand the influence of regulatory bodies on development of consumer products (P1)</p> <p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p> <p>LO3 Be able to use quantitative titration techniques on consumer products (P4)</p> <p>LO4 Be able to use extraction and separation techniques on consumer products (P5, P6)</p> <p>LO5 Be able to test the effectiveness of consumer product tests (P7)</p>

Name of other unit and related LO	This unit:
<p>Unit 16 Waste Management (Food science pathway only)</p> <p>LO4 Be able to test air and water emissions</p>	<p>LO1 Understand the influence of regulatory bodies on development of consumer products (P1)</p> <p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p> <p>LO3 Be able to use quantitative titration techniques on consumer products (P4)</p> <p>LO4 Be able to use extraction and separation techniques on consumer products (P5, P6)</p> <p>LO5 Be able to test the effectiveness of consumer product tests (P7)</p> <p>By carrying out an audit of a site or premises learners will carry out a number of tests on air and water in the laboratory. The 'product' in this case are the results gathered through the audit process</p>
<p>Unit 17 Food technology (Food science pathway only)</p> <p>LO1 Understand the main features of food manufacturing operations</p> <p>LO2 Understand the importance of food safety in food manufacture</p> <p>LO3 Understand the importance of quality control in food manufacture</p> <p>LO4 Be able to test product samples</p>	<p>LO1 Understand the influence of regulatory bodies on development of consumer products (P1)</p> <p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p> <p>LO3 Be able to use quantitative titration techniques on consumer products (P4)</p> <p>LO4 Be able to use extraction and separation techniques on consumer products (P5, P6)</p> <p>LO5 Be able to test the effectiveness of consumer product tests (P7)</p>
<p>Unit 18 Microbiology</p> <p>LO3 Be able to use microbiology in food production</p>	<p>LO4 Be able to use extraction and separation techniques on consumer products (P5, P6)</p>
<p>Unit 19 Crop production and soil science (Food science pathway only)</p> <p>LO3 Be able to monitor the growth of a crop plant species</p> <p>LO4 Be able to carry out soil testing</p>	<p>LO2 Understand how product testing determines the development of consumer products (P2, P3)</p> <p>LO4 Be able to use extraction and separation techniques on consumer products (P5, P6)</p> <p>The 'product' in this case will be the results of the testing on soils when examining particle size, organic and mineral content and pH</p>

To find out more
ocr.org.uk/science

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Alternatively, you can email us on **vocational.qualifications@ocr.org.uk**



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