

GCE Subject Level Guidance for Science (Biology, Chemistry, Physics)

July 2015

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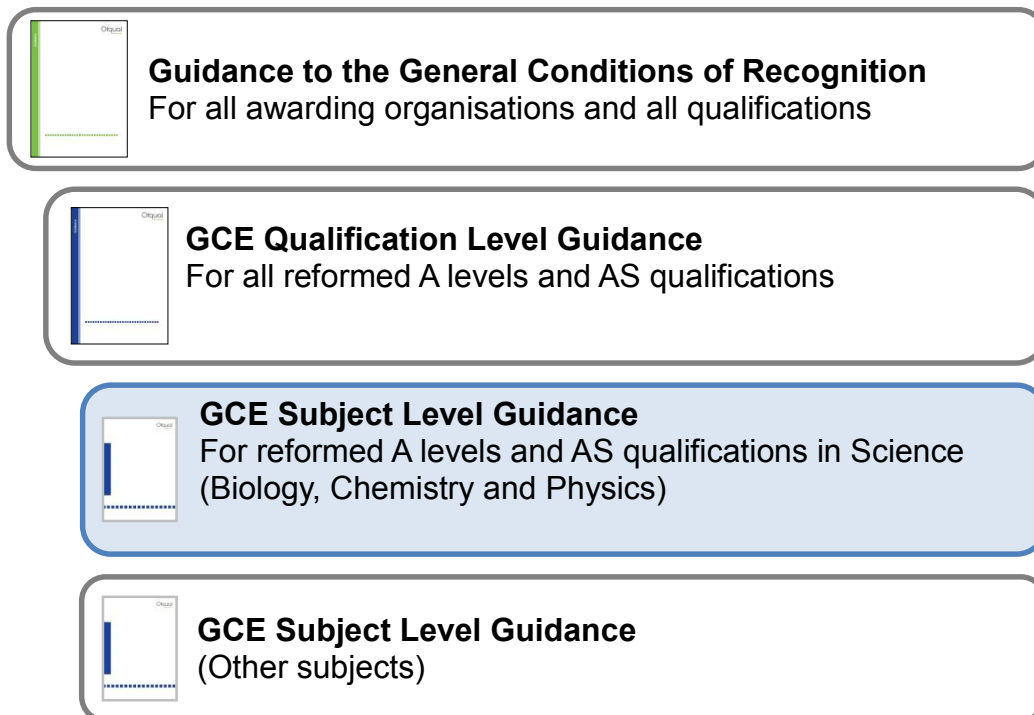
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Introduction

About this document

This document (highlighted in the figure below) is part of a suite of documents which outlines our guidance for awarding organisations offering GCE Qualifications.



This document sets out guidance which applies to all GCE A levels in Biology, Chemistry and Physics awarded on or after 1 April 2017; and all standalone GCE AS qualifications in Biology, Chemistry and Physics awarded on or after 1 April 2016 in the following subjects:

- Biology,
- Chemistry, and
- Physics

This guidance supports both:

- the GCE Qualification Level Conditions and associated requirements;¹ and
- the GCE Subject Level Conditions and associated requirements for Biology, Chemistry and Physics.²

This document constitutes guidance for the purposes of section 153 of the Apprenticeships, Skills, Children and Learning Act 2009 (the '2009 Act') and Condition GCE(Science)1.2.

An awarding organisation has a legal obligation under the 2009 Act to have regard to this guidance in relation to each GCE Qualification in Biology, Chemistry or Physics that it makes available or proposes to make available. Condition GCE(Science)1.2 imposes the same obligation in respect of the guidance below which is issued under that Condition.

An awarding organisation should use this guidance to help it understand how to comply with the GCE Qualification Level Conditions as they apply specifically to GCE Qualifications in Biology, Chemistry or Physics, together with the GCE Subject Level Conditions and associated requirements for such qualifications.

Revisions to this document

The guidance in this document was originally published in May 2014. We have subsequently revised that guidance (see Appendix 1 for details), most recently in July 2015.

The July 2015 version of this document replaces all previous versions, and comes into effect at 12.01am on 21st July 2015 for all GCE Qualifications in Biology, Chemistry and Physics.

Guidance set out in this document

This document provides guidance on the assessment of practical skills through Assessments by Examination in, and assessment objectives for, GCE Qualifications in Biology, Chemistry and Physics

¹ www.ofqual.gov.uk/documents/gce-qualification-level-conditions

² www.gov.uk/government/publications/gce-subject-level-conditions-and-requirements-for-science

Guidance on the assessment of practical skills through Assessments by Examination in GCE Qualifications in Science (Biology, Chemistry and Physics)

Condition GCE(Science)1.1(a) states that an awarding organisation must comply with the requirements outlined by the Secretary of State in the document entitled *GCE AS and A level subject content for biology, chemistry, physics and psychology*³ (the 'Content Document').

Condition GCE(Science)1.1(c) allows us to specify guidance relating to the interpretation of that document.

Appendix 5 to the Content Document states that in order to be able to develop their skills, knowledge and understanding in science, Learners need to develop key skills and behaviours and that specifications must encourage such practical skills through opportunities for regular hands-on practical work. Appendix 5b lists the practical skills identified for direct assessment. These skills will be assessed by the practical science assessment as defined in Condition GCE(Science)3.3.

Appendix 5a lists the practical skills identified for indirect assessment. We expect that at least 15% of the marks available for the Assessments by Examination for such an A level qualification in Biology, Chemistry or Physics will be made available in respect of questions or tasks which indirectly assess a Learner's practical skills as described in Appendix 5a to the Content Document.

³ Department for Education (April 2014) *GCE AS and A level subject content for biology, chemistry, physics and psychology*, DFE-00357-2014, www.gov.uk/government/publications/gce-as-and-a-level-for-science

Guidance on assessment objectives for GCE Qualifications in Science (Biology, Chemistry and Physics)

Condition GCE(Science)1.2 allows us to specify requirements and guidance relating to assessment objectives for GCE Qualifications in Biology, Chemistry or Physics.

We published our requirements in relation to assessment objectives in *GCE Subject Level Conditions and Requirements for Biology*, and reproduce them in the table below.

		<i>A level</i>	<i>AS</i>
AO1	Demonstrate knowledge and understanding of scientific ideas, processes, techniques and procedures	30-35%	35-40%
AO2	Apply knowledge and understanding of scientific ideas, processes, techniques and procedures: <ul style="list-style-type: none"> ■ in a theoretical context ■ in a practical context ■ when handling qualitative data ■ when handling quantitative data 	40-45%	40-45%
AO3	Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to: <ul style="list-style-type: none"> ■ make judgements and reach conclusions ■ develop and refine practical design and procedures 	25-30%	20-25%

We set out below our guidance for the purposes of Condition GCE(Science)1.2. This guidance explains how we expect awarding organisations to interpret these assessment objectives in terms of:

- the different 'strands' within each of the assessment objectives;
- the further discrete 'elements' within each assessment objective and its strands which questions and tasks could target and/or seek to credit – our expectation is that each and every question/task should target or seek to credit at least one of these elements, and may target or seek to credit multiple elements across one or more assessment objectives;
- the coverage expectations, such as in relation to the different strands and elements within each assessment objective and how those strands and elements should be sampled over time; and

- the key areas of emphasis in each assessment objective and the particular meaning for the subject of any key terms and phrases used.

In line with the obligations set out in Condition GCE(Science)1.2, we expect awarding organisations to be able to demonstrate how they have had regard to this guidance. For example, an awarding organisation could map how it has regard to the guidance as it:

- develops its sample assessment materials;
- delivers the qualification;
- develops and applies its approach to sampling the elements into which the assessment objectives are divided; and
- monitors the qualification to make sure it addresses all elements appropriately.

AO1: Demonstrate knowledge and understanding of scientific ideas, processes, techniques and procedures		30-35% (A level) 35-40% (AS)	
Strands	Elements	Coverage	Agreements and definitions
n/a	1a – Demonstrate knowledge and understanding of scientific ideas	Balanced coverage of all elements in each set of assessments (but not every assessment) Up to 10% (i.e. approximately one-third of AO1) for ‘recall-only items’	<ul style="list-style-type: none"> ■ The emphasis here is on Learners recalling and communicating relevant knowledge and understanding from the course of study, for instance of facts, definitions, explanations, how to do something and why it should be done in a particular way. ■ This knowledge and understanding should be based principally on the requirements that are detailed in the specification or on what might be considered assumed prior knowledge. ■ Generally, questions/tasks would target and/or permit Learners to show knowledge and understanding in combination, for instance, the requirement to define or explain a term in their own words. ■ However, there should also be the potential for a small proportion of items to focus on recall only – these items would comprise, for instance, standard definitions of terms/concepts as opposed to explanations of these. ■ There is no intrinsic difference in the Levels of Demand between ‘processes, techniques and procedures’, and they are a linked set of operations, so are not separated here, though there are different, legitimate ways of defining each of them; the focus in ‘ideas’ may be different, so these are included separately.
	1b – Demonstrate knowledge and understanding of scientific processes, techniques and procedures		

AO2: Apply knowledge and understanding of scientific ideas, processes, techniques and procedures:		40-45% (A level) 40-45% (AS)	
<ul style="list-style-type: none"> ■ in a theoretical context ■ in a practical context ■ when handling qualitative data ■ when handling quantitative data 			
Strands	Elements	Coverage	Agreements and definitions
The four strands below should be targeted in combination: in a theoretical context in a practical context when handling qualitative data when handling quantitative data	1a – Apply knowledge and understanding of scientific ideas in a theoretical context when handling qualitative data	Balanced coverage of all elements in each set of assessments (but not every assessment)	<ul style="list-style-type: none"> ■ The emphasis here is on Learners applying their knowledge and understanding to provide meaning or explanation, for instance to connect theory with particular contexts, stimuli or materials. ■ This application should relate principally to: <ul style="list-style-type: none"> □ novel situations that are not clearly indicated in the specification; □ developing further material that is covered in the specification; or □ making links between such types of material, which are not signalled in the specification. ■ The application should also involve determining how to make sense of connections and linkages within data, information and detail; though not to the
	1b – Apply knowledge and understanding of scientific ideas in a theoretical context when handling quantitative data		
	1c – Apply knowledge and understanding of scientific ideas in a practical context when handling qualitative data		
	1d – Apply knowledge and understanding of scientific ideas in a practical context when handling quantitative data		
	1e – Apply knowledge and understanding of scientific processes, techniques and procedures in a theoretical context when handling qualitative data		
	1f – Apply knowledge and understanding of scientific processes, techniques and		

AO2: Apply knowledge and understanding of scientific ideas, processes, techniques and procedures:		40-45% (A level) 40-45% (AS)	
<ul style="list-style-type: none"> ■ in a theoretical context ■ in a practical context ■ when handling qualitative data ■ when handling quantitative data 			
Strands	Elements	Coverage	Agreements and definitions
	procedures in a theoretical context when handling quantitative data		<p>extent of reaching conclusions or making judgements.</p> <ul style="list-style-type: none"> ■ The balance of qualitative and quantitative data that is appropriate is likely to vary across the subjects in the suite. This issue is linked to the additional requirements relating to mathematical skills specified for each science subject. ■ Items should require evidence-based responses to assess active processing of knowledge and understanding.
	1g – Apply knowledge and understanding of scientific processes, techniques and procedures in a practical context when handling qualitative data		
	1h – Apply knowledge and understanding of scientific processes, techniques and procedures in a practical context when handling quantitative data		

AO3: Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to:		25-30% (A level) 20-25% (AS)	
<ul style="list-style-type: none"> ■ make judgements and reach conclusions ■ develop and refine practical design and procedures 			
Strands	Elements	Coverage	Agreements and definitions
1 – Make judgements and reach conclusions	1a – By analysing scientific information, ideas and evidence, including in relation to issues	Balanced coverage of all elements in each set of assessments (but not every assessment)	<ul style="list-style-type: none"> ■ The emphasis here is on the outcome that Learners produce through the analysis of evidence, for instance the judgement or conclusion or development/refinement of design/procedures that stems from their reasoning and synthesis of skills. ■ The abilities to interpret and evaluate in this context are both linked and complementary. ■ There is a requirement to address a range of material here. This means that relevant assessment tasks should involve different types of information sources across questions in an set of assessments. However, an individual item could address a single type of information source. ■ When addressing this assessment objective, Learners would be required to reach conclusions which would therefore incorporate the requirement to make judgements. Where Learners' conclusions relate to practical work, they would involve either refining practical design and procedures or developing/planning practical procedures to solve problems. ■ The balance of requirement for judgement, conclusion and development/refinement of design/procedures that is
	1b – By interpreting and evaluating scientific information, ideas and evidence, including in relation to issues		
2 – Develop and refine practical design and procedures	2a – By analysing scientific information, ideas and evidence, including in relation to issues		
	2b – By interpreting and evaluating scientific information, ideas and evidence, including in relation to issues		

AO3: Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to: <ul style="list-style-type: none"> ▪ make judgements and reach conclusions ▪ develop and refine practical design and procedures 			25-30% (A level) 20-25% (AS)
Strands	Elements	Coverage	Agreements and definitions
			<p>appropriate is likely to vary across the subjects in the suite.</p>

Appendix 1: Revisions to the guidance in this document

The table below sets out when the guidance in the *GCE Subject Level Guidance for Science (Biology Chemistry, Physics)* initially came into force and when it was subsequently revised.

Revisions	Date in force
<ul style="list-style-type: none">▪ Republished as a consolidated document for all three subjects – <i>Subject Level Guidance for Science (Biology Chemistry, Physics)</i>▪ Guidance on the assessment of practical skills through Assessments by Examination in GCE Qualifications in Science (Biology, Chemistry and Physics)	21st July 2015
First edition (published as three separate documents – <ul style="list-style-type: none">▪ <i>GCE Subject Level Guidance for Biology,</i>▪ <i>GCE Subject Level Guidance for Chemistry, and</i>▪ <i>GCE Subject Level Guidance for Physics)</i>	23rd May 2014

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