

Version 1.0



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

# General Certificate of Secondary Education

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## Design and Technology (Food Technology) 2010 Full and Short Course

This specification should be read in conjunction with:

Specimen and Past Papers and Mark Schemes  
Reports on the Examination  
Teachers' Guide

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AQA GCSE 3542

AQA GCSE (Short Course) 3552

The specification will be published annually on the AQA Website ([www.aqa.org.uk](http://www.aqa.org.uk)). If there are any changes to the specification centres will be notified in print as well as on the website. In the case of any difference between the printed and the website version of the specification, the version with the highest number, as currently published on the AQA Website, is the definitive one.

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## Background Information

### 1

## The Revised General Certificate of Secondary Education

Following a review of the National Curriculum requirements, and the establishment of the National Qualifications Framework, all the unitary awarding bodies have revised their GCSE syllabuses for examination in 2003 onwards.

### 1.1 Changes at GCSE

#### Key Skills

All GCSE specifications must identify, as appropriate, opportunities for generating evidence on which candidates may be assessed in the “main” Key Skills of communication, application of number and information technology at the appropriate level(s). Also, where appropriate, they must identify opportunities for developing and generating evidence for addressing the “wider” Key Skills of working with others, improving own learning and performance and problem solving. Design and Technology is uniquely placed to provide opportunities for all six Key Skills.

#### Spiritual, moral, ethical, social, cultural, environmental, health and safety and European Issues

All specifications must identify ways in which the study of the subject can contribute to an awareness and understanding of these issues.

#### ICT

The National Curriculum requires that students should be given opportunities to apply and develop their ICT capacity through the use of ICT tools to support their learning. In each specification candidates will be required to make effective use of ICT in ways appropriate to the needs of the subject.

#### Tiering

In most subjects the scheme of assessment must include question papers, targeted at two tiers of grades, i.e. A\* - D and C - G.

A safety net of an allowed Grade E will be provided for candidates entered for the higher tier who just fail to achieve Grade D. The questions will still be targeted at A\* - D.

#### Citizenship

From 2002, students in England will be required to study Citizenship as a National Curriculum subject. Each GCSE specification must signpost, where appropriate, opportunities for developing citizenship knowledge, skills and understanding.

**1.2 Changes to the Design and Technology Criteria**

The main changes to the Design and Technology Criteria are given below.

- a. The Aims have been simplified to reflect the National Curriculum requirements, but it should be noted that they now include a consideration of the influences of past and present design and technology on society.
- b. The Assessment Objectives have been expanded.
  - AO1 consists of materials, components, processes techniques and industrial practices.
  - AO2 combines designing and making into one objective.
  - AO3 evaluation of processes and products includes examining the wider effects of design and technology on society
- c. Greater emphasis has been placed on ICT, particularly CAD/CAM.

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**1.3 Changes to the Design and Technology (Food Technology) specification**

The Design and Technology (Food Technology) specification has been revised and updated to take account of the latest developments in the teaching of food technology.

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# Specification at a Glance

## *Design and Technology (Food Technology)*

This specification is one of a suite of seven in Design and Technology offered by AQA. There are two tiers of assessment: Foundation (G-C) and Higher (D-A\*).

	<b>GCSE (Full Course) 3542</b>
	<p>Written Paper <span style="float: right;">40% of total marks</span></p> <p>Foundation Tier <span style="float: right;">2 hours</span></p> <p>Higher Tier <span style="float: right;">2 hours</span></p> <p>The paper will test all Assessment Objectives through a range of questions. All questions are compulsory.</p> <p>A Preparation Sheet will be issued to candidates at the beginning of March. This sheet is common to the Full and Short Courses and to the foundation and higher tier papers. It will give advance notice of the design context for some questions on the paper.</p>
Foundation Tier	<p>Coursework Project <span style="float: right;">60% of total marks not to exceed 40 hours</span></p> <p>Coursework consists of a project which addresses all the assessment objectives in an integrated way. The evidence required for the project consists of a food product prototype(s) and a concise design folder and/or the appropriate ICT evidence.</p>
3542F	
Higher Tier	<p style="text-align: center;"><b>GCSE (Short Course) 3552</b></p> <p>Written Paper <span style="float: right;">40% of total marks</span></p> <p>Foundation Tier <span style="float: right;">1½ hours</span></p> <p>Higher Tier <span style="float: right;">1½ hours</span></p> <p>The paper will test all Assessment Objectives through a range of questions. All questions are compulsory.</p> <p>The same Preparation Sheet as for the full course will be issued to candidates at the beginning of March. This sheet is common to the foundation and higher tier papers and will give advance notice of the design context for some questions on the paper.</p>
3542H	
Foundation Tier	<p>Coursework Project <span style="float: right;">60% of total marks not to exceed 20 hours</span></p> <p>Coursework consists of a project which addresses all the assessment objectives in an integrated way. The evidence required for the project consists of a food product prototype(s) and a concise design folder and/or the appropriate ICT evidence.</p>
3552F	
Higher Tier	
3552H	

# 3

## Availability of Assessment Units and Entry Details

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### 3.1 Availability of Assessment Units

Examinations based on this Specification are available in the June examination series only.

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### 3.2 Entry Codes

Normal entry requirements apply, but the following information should be noted.

The **Subject Code** for entry to the GCSE award is 3542.

The **Subject Code** for entry to the GCSE (Short Course) award is 3552.

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### 3.3 Classification Codes

Each specification is assigned to a national classification code, indicating the subject area to which it belongs.

Centres should be aware that candidates who enter for more than one GCSE qualification with the same classification code, will have only one grade (the highest) counted for the purpose of the School and College Performance Tables.

The classification code for this specification is 9020.

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### 3.4 Private Candidates

This specification is not available for private candidates.



**3.5 Access Arrangements and Special Consideration**

AQA pays due regard to the provisions of the Disability Discrimination Act 1995 in its administration of this specification.

Arrangements may be made to enable candidates with disabilities or other difficulties to access the assessment. An example of an access arrangement is the production of a Braille paper for a candidate with a visual impairment. Special consideration may be requested for candidates whose work has been affected by illness or other exceptional circumstances.

Further details can be found in the Joint Council for Qualifications (JCQ) document:

*Access Arrangements and Special Consideration*

*Regulations and Guidance Relating to Candidates who are Eligible for Adjustments in Examination*

*GCE, AEA, VCE, GCSE, GNVQ, Entry Level & Key Skills*

This document can be viewed via the AQA web site ([www.aqa.org.uk](http://www.aqa.org.uk))

Applications for access arrangements and special consideration should be submitted to AQA by the Examinations Officer at the centre.

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**3.6 Language of Examinations**

All assessments will be through the medium of English. Assessment materials will not be provided in Welsh or Gaelge.

# Scheme of Assessment

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## Introduction

### 4.1 National Criteria

This GCSE Design and Technology (Food Technology) specification complies with the following:

- The GCSE Subject Criteria for Design and Technology;
- The GCSE, GCE, GNVQ and AEA Code of Practice April 2008;
- The GCSE Qualification Specific Criteria;
- The Arrangements for the Statutory Regulation of External Qualifications in England, Wales and Northern Ireland: Common Criteria.
- The National Curriculum Order for Design and Technology.

### 4.2 Rationale

This specification will allow candidates to specialise in the focus area of food technology where they will learn about designing and making a saleable food product by applying knowledge and understanding to develop and modify existing products.

### 4.3 Prior level of attainment and recommended prior learning

The specification builds on the Key Stage 3 programme of study for Design and Technology. It is expected that candidates will have followed this programme before commencing work on this specification.

It will be beneficial for candidates to have achieved at least Level 1 in the Key Skills of *Application of Number*, *Communication*, and *Information Technology* to cope with the demands of this specification.

### 4.4 Progression

This qualification is a recognised part of the National Qualifications framework. As such, GCSE provides progression from Key Stage 3 through Key Stage 4 to post-16 studies. It lays an appropriate foundation for further study of Design and Technology.

## 5

## Aims

A course based on this specification should encourage candidates to

- a. demonstrate fully their design and technology capability, which requires them to combine skills with knowledge and understanding in order to design and make quality products in quantity;
- b. acquire and apply knowledge, skills and understanding through:
  - analysing and evaluating products and processes;
  - engaging in focused tasks to develop and demonstrate techniques;
  - engaging in strategies for developing ideas, planning and producing products;
  - considering how past and present design and technology, relevant to a designing and making context, affects society;
  - recognising the moral, cultural and environmental issues inherent in design and technology.

## 6

## Assessment Objectives

### 6.1 Assessment Objectives

Candidates should be able to demonstrate their design and technology capability through acquiring and applying knowledge, skills and understanding:

- a. of materials, components, processes, techniques and industrial practice;
- b. when designing and making quality products in quantity;
- c. when evaluating processes and products and examining the wider effects of design and technology on society.

### 6.2 Quality of Written Communication

Where candidates are required to produce extended written material in English, they will be assessed on the quality of written communication. Candidates will be required to:

- present relevant information in a form that suits its purposes;
- ensure that text is legible and that spelling, punctuation and grammar are accurate, so that meaning is clear.

Quality of written communication will be assessed in candidates' coursework design folders.

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# Scheme of Assessment

## 7.1 Full Course Assessment Units

The Scheme of Assessment comprises two components.

### Written Paper

40% of the marks

Foundation Tier	2 hours	125 marks
Higher Tier	2 hours	125 marks

All questions are compulsory.

Questions will test the application of knowledge and understanding of materials, components, processes, techniques, technologies and the evaluation of commercial practices and food products.

A Preparation Sheet will be issued to candidates at the beginning of March. This sheet is common to the foundation and higher tier papers and will give advance notice of the design context for some questions on the paper.

Coursework Project	40 hours	60% of the marks
		95 marks

The coursework project will be internally assessed and externally moderated. Full details on coursework are given in Sections 14-20 below.

The project should address all three assessment objectives in an integrated way. Candidates are required to submit a food product prototype(s) and a concise design folder and/or appropriate ICT evidence.

Throughout the project candidates should address the industrial and commercial practices, and the moral, social, cultural and environmental issues, arising from their work.

Experience has shown that candidates are often highly motivated where they devise their own project outlines. This is, therefore, to be encouraged and guidelines for the preparation of outlines are given in para 15.1. Examples of suitable project outlines are given in 15.2 which can also provide starting points for candidates.

Centres should ensure that candidates embark on projects that can satisfy the coursework requirements and be completed in 40 hours.

The assessment criteria in Section 16 should be used as a guide for teachers and candidates to the type of work and the standards required.

## 7.2 Short Course Assessment Units

The Scheme of Assessment comprises two components.

### Written Paper

40% of the marks

Foundation Tier	1½ hours	100 marks
Higher Tier	1½ hours	100 marks

All questions are compulsory.

Questions will test the application of knowledge and understanding of materials, components, processes, techniques, technologies and the evaluation of commercial practices and food products.

The same Preparation Sheet as for the full course will be issued to candidates at the beginning of March. This sheet is common to the foundation and higher tier papers and will give advance notice of the design context for some questions on the paper.

Coursework Project 20 hours

60% of the marks 95 marks

The coursework project will be internally assessed and externally moderated. Full details on coursework are given in Sections 14-20 below.

For short course projects, it is essential that an appropriate project outline or brief is selected which will allow candidates to satisfy all the requirements within the 20 hours permitted. See Paragraph 14.3 for further guidance.

The project should address all three assessment objectives in an integrated way. Candidates are required to submit a food product prototype(s) and a concise design folder and/or appropriate ICT evidence.

Throughout the project candidates should address the industrial and commercial practices, and the moral, social, cultural and environmental issues, arising from their work.

Experience has shown that candidates are often highly motivated where they devise their own project outlines. This is, therefore, to be encouraged and guidelines for the preparation of outlines are given in para 15.1. Examples of suitable project outlines are given in 15.2 which can also provide starting points for candidates.

The assessment criteria in Section 16 should be used as a guide for teachers and candidates to the type of work and the standards required.

### 7.3 Weighting of Assessment Objectives

For both the full and short courses, the approximate relationship between the relative percentage weighting of the Assessment Objectives (AOs) and the overall Scheme of Assessment is shown in the following table:

Assessment Objectives	Component Weightings (%)		Overall Weighting of AOs (%)
	Coursework	Written Paper	
1 Materials and Components	10	10	20
2 Designing and Making	40	20	60
3 Evaluation and Social Issues	10	10	20
<b>Overall Weighting of Units (%)</b>	<b>60</b>	<b>40</b>	<b>100</b>

Candidates' marks for each assessment unit are scaled to achieve the correct weightings.

## Subject Content

### 8

## Summary of Subject Content

### 9 Designing and Making Skills

Section 9 specifies the general designing and making skills required for both the full and short courses and the knowledge and understanding candidates should acquire.

### 10 Full Course

Section 10 specifies the Full Course content.

### 11 Short Course

Section 11 specifies the Short Course content.

Each course is presented under the following three broad areas of study:

Food Materials and Components;  
Food Product Design, Development and Market Influences;  
Food Processes and Product Manufacture.

### 9

## Designing and Making Skills

Design and Technology is a practical subject area which requires the application of knowledge and understanding when developing ideas, planning, producing products and evaluating them. The distinction between Designing and Making is a convenient one to make, but in practice the two often merge. For example, research can involve not only investigating printed matter and people's opinions, but also investigating proportions, colour, structures, taste and materials through practical work.

The skills which follow are common to both the Full Course and the Short Course and underpin all learning and cover the programme of study for KS4 Design and Technology.

### 9.1 Designing Skills

#### Candidates should be taught:

to understand the basic design principles of line, form and colour and their application in designing;

to develop and use design briefs, detailed specifications and criteria in relation to product development;

- to consider the conflicting demands that moral, cultural, economic, environmental, historical and social issues can make in the planning and in the designing of products;
- to consider their own health and safety and that of makers, manufacturers, individual users and society at large;
- to consider an increasing range of users of products and different societies in relation to their differing needs and values;
- to anticipate and design for product maintenance;
- to design for manufacturing in quantity;
- to plan for quality control and quality assurance when designing products and to be aware of the difference;
- to generate design proposals against stated design criteria, and to modify their proposals in the light of on-going analysis, evaluation and product development;
- to use graphic techniques and ICT, including CAD to generate, develop, model and communicate design proposals;
- to match materials and components with tools, equipment and processes, taking account of critical dimensions and tolerances when deciding how to manufacture the product;
- to produce and use detailed working schedules that will achieve the desired objectives in the time available, setting realistic deadlines for the various stages of manufacture, identifying critical points in the making process and providing alternatives to possible problems;
- to devise and apply test procedures to check the quality of their work at critical points during development, and to indicate ways of modifying and improving it when necessary;
- to be flexible and adaptable in their designing, in order to respond to problems, changing circumstances and new opportunities;
- to ensure that the quality of their design solution will be suitable for intended clients and consumers;
- to understand the difference between quality of design and quality of manufacture and use essential criteria to evaluate the quality of products they have made and products which have been made commercially.

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## 9.2 Making Skills

### Candidates should be taught:

- to match materials and components with tools, equipment and processes to produce quality products;



to use tools and equipment safely, accurately and efficiently to achieve an appropriate fit, finish and reliable functioning in products that match their specifications;

to use a range of industrial applications when working with familiar materials and processes;

to manufacture products singly and in quantity, including the practical application of quality control and quality assurance techniques;

to use computer-aided manufacture (CAM) in single item production and in batch or volume production;

to simulate production and assembly lines including the use of ICT;

to be adaptable in their working practices, in order to respond to changing circumstances and new opportunities;

to ensure, through testing, modification and evaluation, that the quality of their products is suitable for intended users and devise modifications where necessary that would improve performance.

## Full Course

### *Food Materials and Components*

Candidates should be given the opportunity to work with a range of foods in order to gain knowledge and understanding of the working characteristics and processing techniques used when designing and making food products.

Materials should not be taught in isolation from the process of making food products. Throughout the course, candidates must be taught to relate the workings and functions of a wide range of materials, food products and applications to the intended purpose and market of the product, the availability of components, the choice of materials and components, the ways in which they are used and the processes involved in their manufacture.

#### Candidates should:

#### Possible learning experiences

#### 10.1 The composition, structure and properties of food

investigate the physical and chemical properties of starch, sugar, protein and fat;

Investigation of how: starch thickens; sugar flavours, colours, caramelises; protein aerates, coagulates; fats, shorten, emulsify.

#### 10.2 The working characteristics of food

understand the factors which influence desired outcomes/ finish of a food product: flavour, colour, volume, shape, palatability through evaluation of existing products and production methods;

Assess and test for factors which influence product outcomes, e.g.

- volume: aeration, raising agents in cakes;
- shape: consistency, elasticity in bread;
- flavour: sweetening agents in desserts;
- colour: fats for shortening in pastry;
- emulsification: fats/oils in cake mixtures, salad dressings;
- palatability: gelatinisation of starch in sauce making.

demonstrate the ability to manipulate foods in appropriate amounts and ratio/proportions to achieve designated criteria;

Produce different types of pastry using different ratios and proportions.

	<b>Candidates should:</b>	<b>Possible learning experiences</b>
	<p>demonstrate the safe use and effect of alternative ingredients;</p> <p>identify where and why ‘smart’ materials are used in food production;</p>	<p>Evaluate how a product’s quality and sensory characteristics can be maintained, e.g. how lack of flavours from using Quorn, TVP can be compensated for by adding other ingredients.</p> <p>Investigate the effects of using modified starch, low fat spreads, sugar substitutes.</p>
<p><b>10.3</b>    <b>The effect of temperature on processing and storage of food</b></p>	<p>understand the effect of temperature on foods;</p> <p>understand commercial methods of food processing by temperature and heat processing: freezing, cook-chill, UHT;</p> <p>understand and apply control testing to ensure critical points are identified in the manufacture of food products;</p> <p>apply the necessary control tests at appropriate stages of development in their own products and take any appropriate remedial action;</p>	<p>Investigate the effect of temperature on a food or food product, e.g. different cooking methods on potatoes.</p> <p>Effects of freezing on fruit and vegetables.</p> <p>Examine and evaluate one type of processed food, e.g. milk.</p> <p>Use of temperature control, e.g. production of a high ratio sugar product - fudge, toffee, jam. Bread production.</p> <p>Use probes within a microwave oven, temperature control in food storage.</p>
<p><b>10.4</b>    <b>The effect of other factors, acids, alkalis, micro-organisms</b></p>	<p>understand the factors which enable the food products to be developed to designated criteria: i.e. colour, texture, storage, product profile.</p>	<p>Select and combine foods to produce different textures, finishes, shapes, size and appearance.</p> <p>Evaluate products and assess how characteristics have been achieved, e.g. the effect of vinegar/cornflour on the texture of meringue; retention of colour in fruit salad, e.g. lemon juice.</p>

## **Food Product Design, Development and Market Influences**

Candidates should be able to apply knowledge and understanding of the working characteristics of food with processing techniques to design and make a food product.

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### **Candidates should:**

### **Possible learning experiences**

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#### **10.5 The opportunity for food product development**

examine a range of existing products for a specific target group/need;

Test products against designated criteria.

test existing products to assess their suitability;

Evaluate existing products/  
product appraisal.

identify physical, nutritional characteristics in order to develop design criteria and their own ideas;

find out customer views and preferences using a range of methods including ICT;

Design a questionnaire/survey using computer data base.

Gather information including use of e-mail.

Collate and analyse data.

Present results in computer generated charts and graph formats.

compare a range of existing packaged products to determine how the types and proportions of ingredients and the manufacturing processes have contributed to a product's overall characteristics and its ability to meet a specific need;

Examine a range of multicultural products and identify the sensory and structural differences.

Collect results on spreadsheets.

Generate radar diagrams.

gather and use appropriate information from a range of sources including electronic media to produce design criteria and generate ideas;

Summarise information which has been obtained from the internet or CD ROM.

	<b>Candidates should:</b>	<b>Possible learning experiences</b>
<b>10.6 The stages of food product development</b>	appraise, amend or adapt existing products or ideas;	Carry out product analysis.
	produce initial design criteria;	Produce a list of general criteria which reflects research and views of others, e.g. time/cost/use of resources, impact on the environment, nutritional profile etc.
	generate ideas for new food products or food product development including products for various ages, cultures and dietary needs;	Identify target group or dietary need. Produce sketches, diagrams, pictures using a range of techniques including CAD.
	carry out product formulation; evaluate, test and refine ideas;	Develop initial ideas.
	draw up a product specification;	Identify and list the detailed requirements for the final product prototype.
	develop food product prototype;	Use digital camera to record results.
	use CAD to model nutritional profiles for products;	Use nutritional analysis to evaluate developments in line with specification.
	apply knowledge of food materials and processing;	
	carry out modification and reformulation;	Use investigations, testing and adaptations to shape, size, finish, weight, volume, taste, texture, etc.
	demonstrate how availability of materials, equipment and processes can alter or determine end product;	Evaluate commercial food production methods, ingredients and equipment used.
	carry out sensory evaluation, i.e. product profile, difference tests, ranking, test marketing against original specification;	Carry out sensory analysis techniques e.g. tests to identify/determine key characteristics.
	produce manufacturing specification;	Produce very detailed list of requirements which a manufacturer would need.
	identify where standard components might be used in the manufacture of the prototype;	List which parts of the product would be purchased as standard components.
	identify and apply quality control procedures;	Produce a quality control checklist.

**Candidates should:**

**Possible learning experiences**

identify control procedures for manufacturing development;  
evaluate appropriate manufacturing methods;

Produce a HACCP procedure for the prototype.  
Describe the most appropriate method for production.

**10.7 The application of appropriate screening and checking procedures in a food production system in order to provide feedback, monitor performance and ensure quality control**

analyse an example of a commercial food production system, including the identification of strategies for identifying hazards and controlling risks;

Visit/video/speaker/case study of food production or manufacture.

use CAD to simulate a manufacturing procedure;

Use Internet to visit virtual reality manufacturing site.

identify 'input, process and output' and the stages at which feedback would be given in food production;

Use computer software to generate a HACCP procedure for a product prototype.

understand the application of CAM within food product development;

Illustrate system through flow chart, block diagram or computer simulation and relate to commercial system, e.g. fast food outlet, bakery.

understand how sensors and control can be applied within the food industry to ensure a specified outcome;

Identify where CAM could be used in the subsequent manufacture of a prototype e.g. combining ingredients, enrobing, filling.

understand and apply the need for controlled testing including computer control and monitoring to identify critical points in production;

Evaluate computer controlled production system, baking industry e.g. bread production.

Use sensors to log pH ranges when making yoghurt.

Apply temperature control when proving bread, baking biscuits, setting gels, tempering chocolate.

**10.8 Labelling, information, legislation and codes of practice**

understand the requirements for conveying information to the end user;

Compile the required data/instructions/information for a specified food product.

use CAD to design and model packaging information;

Use nutritional analysis software to generate nutritional information for a label.

	<b>Candidates should:</b>	<b>Possible learning experiences</b>
<b>10.9</b>	<p><b>Awareness of the social and economic implications of food production and processing technology including application of nutritional knowledge and appropriate use of resources</b></p>	
	<p>apply nutritional knowledge when designing a food product;</p>	<p>Develop products which meet the particular needs of a target consumer group.</p>
	<p>use computer analysis of nutritional data to study the effect of food products on health;</p>	<p>Assess food products for their nutritional content. Make suggestions for modification to meet design specification.</p>
	<p>investigate existing packaging materials and make an appropriate selection of materials for use during the preparation, cooking and/or storage of a food product;</p>	<p>Examine types of materials used and evaluate their suitability for a specified food product, e.g. cook-chill containers, fast food cartons, boil-in-the-bag.</p>
	<p>assess the impact of packaging on the product cost and the environment;</p>	
	<p>take account of historical and cultural factors that may influence the development of a food product;</p>	<p>Study a fast food outlet to identify how products offered are influenced by the culture of the area.</p>
	<p>distinguish between quality of design and quality of manufacture;</p>	<p>Evaluate outcome against intended specification and design criteria.</p>
	<p>identify and reduce risks through Risk Assessment;</p>	<p>Review of safety and hygiene practices, e.g. making chocolate mousse, cook-chill process.</p>
	<p>identify beneficial and detrimental effects of additives;</p>	
	<p>identify and use criteria to judge the quality of a product, to include meeting the specific need, fitness for purpose and appropriate use of time and materials;</p>	<p>Produce a quality control checklist.</p>
	<p>consider wider moral, social, cultural and environmental implications of their product and its component parts;</p>	<p>Consideration of use of scarce resources, cost of transport, religious preferences, genetically modified foods, organic foods.</p>
	<p>consider the need, function and effect of ‘smart’ materials;</p>	<p>Evaluate the use of modified starch in food products.</p>

## Food Processes and Product Manufacture

Candidates should know and understand that food products are developed by combining ingredients and/or components and by using a range of techniques, processes and equipment.

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### Candidates should:

### Possible learning experiences

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**10.10 The effect of combining different ingredients and the interaction of foods during preparation and cooking**

understand how structures are formed i.e. solutions, suspensions, emulsions, gels;

Recipe development, e.g. different types of salad dressings, sauces, cold sweets.

combine foods for designated outcome in terms of consistency, volume, texture, flavour;

Product development using different ingredients/quantities and methods of production e.g. different types of pastry, outcomes from rubbed in mixtures.

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**10.11 The importance of appropriate proportions on the structure, shape and volume of mixtures**

demonstrate how accurate measurement, ratio and proportioning affect preparation, making and shaping of products to designated criteria;

Accurate weighing and measuring of ingredients, ratio and proportions to achieve acceptable outcome.

Adaptation of amounts in mixtures, e.g. liquid in bread, cakes and biscuits, fat in cakes.

understand why standard components are used in food manufacturing;

select and use standard components;

Demonstrate use of standard components e.g. pizza base, canned pie-filling in own product development.

relate own product development to industrial application i.e. uniformity, fine finish, waste reduction, methods of production designated tolerances;

Use of appropriate amounts and types of ingredients and processing techniques to meet designated criteria and tolerances, e.g. aeration, glaze, sizes and thicknesses.



	<b>Candidates should:</b>	<b>Possible learning experiences</b>
<b>10.12</b> The need and effect of additives on the appearance, flavour, consistency and storage of food	understand the use of artificial additives to enhance aroma, texture, colour, flavour, shelf-life, nutritive value, in commercial and non-commercial products;	Evaluate the use and application of appropriate additives in the development and acceptability of a food product in terms of organoleptic qualities.
<b>10.13</b> Selection and use of equipment for a particular task or process to produce a consistent result in both test kitchen and industrial production	<p>use a range of hand/electrical/mechanical equipment for a specific purpose or desired effect;</p> <p>demonstrate the ability to work to designated tolerances to ensure consistency of outcome;</p> <p>identify appropriate industrial equipment which could be used within large scale production including CAM;</p> <p>understand how CAM develops a consistent, standard outcome;</p>	<p>Select and use a range of equipment which ensures quality and consistency of outcome, e.g. cutting, agitation, reduction of time, effort, skill.</p> <p>Produce replicated mixtures by accuracy in combining dry and liquid ingredients e.g. batch production of bread, cake.</p> <p>Rolling dough/pastry to appropriate and even depth.</p> <p>Evaluate the benefits of computer controlled production processes.</p> <p>Use pre-programmed equipment to replicate products, e.g. bread maker, ice cream maker.</p>
<b>10.14</b> The beneficial and detrimental effect of micro organisms and enzymes on food	<p>understand risk assessment through the use of risk assessment criteria;</p> <p>develop and apply systems for ensuring safe supply, storage, handling during preparation and production of food products;</p> <p>understand the role of micro biology and enzymes in the manufacture of food products, i.e. yoghurt, cheese, quorn which are safe to eat;</p> <p>apply appropriate safety and hygiene rules as designers, producers and consumers;</p>	<p>Design a flow chart to indicate points of hazard and risk, and how these can be eliminated.</p> <p>Gather information on incidence of food contamination and spoilage.</p> <p>Apply safe food handling techniques at all stages from raw material to product.</p> <p>Compare methods of food production.</p> <p>Produce instructions for the safe storage/shelf life of a product.</p> <p>Design a flow chart for the production of a cook-chill food, indicate points of risk.</p>

**Candidates should:**

**Possible learning experiences**

10.15 Preparation and preservation methods that affect quality and storage of food products

understand the reasons for the changes which occur in ingredients and products during preparation and preservation.

Investigate the effects of freezing and chilling on a range of products.

Use sensory evaluation to compare effects of different methods of preservation and production on a food e.g. milk, tomatoes.

## Short Course

### *Food Materials and Components*

Candidates should be given the opportunity to work with a range of foods in order to gain knowledge and understanding of the working characteristics and processing techniques used when designing and making food products.

Materials should not be taught in isolation from the process of making food products. Throughout the course, candidates must be taught to relate the workings and functions of a wide range of materials, food products and applications to the intended purpose and market of the product, the availability of components, the choice of materials and components, the ways in which they are used and the processes involved in their manufacture.

	<b>Candidates should:</b>	<b>Possible learning experiences</b>
11.1 <b>The composition, structure and properties of food</b>	investigate the properties of the following: starch, sugar, protein, fat;	Investigate how the properties of the following are achieved: starch – thickening; sugar – flavour, colour, caramelisation; protein – aeration, coagulation; fat – shortening, emulsification.
11.2 <b>The working characteristics of food</b>	demonstrate the ability to manipulate foods in appropriate amounts and ratio/proportion to achieve designated criteria;	Produce different types of sauces to produce a range of textures, consistencies, flavours.  Produce biscuits by different methods.
11.3 <b>The effect of temperature on processing and storage of food</b>	understand the effect of temperature on food and/or food mixtures, freezing, cook-chill, microwave;	Investigate the effect of freezing on fruit and vegetables.  Effect of different cooking methods, e.g. on potatoes.
11.4 <b>The effect of other factors: acids, alkalis, micro-organisms</b>	understand the factors which enable food products to be developed to designated criteria: texture, colour, storage.	Assess how outcomes have been achieved, e.g. - the effect of vinegar/cornflour on the texture of meringue; - how colour of fruit salad is retained using lemon juice.

## **Food Product Design, Development and Market Influences**

Candidates should be able to apply knowledge and understanding of the working characteristics of food with processing techniques to design and make a food products.

	<b>Candidates should:</b>	<b>Possible learning experiences</b>
<b>11.5</b>	<b>The opportunity for food product development</b>	
	compare a range of existing packaged products to determine how the types and proportions of ingredients and the manufacturing processes have contributed to a product's overall characteristics and its ability to meet a specific need;	Evaluate existing products/ product analysis - Gather information through survey including use of e-mail. - Collate and analyse data using computer database.
<b>11.6</b>	<b>The stages of food product development</b>	
	appraise, amend, adapt existing products or ideas and use ICT to record information;	Analyse a range of multicultural products and identify the sensory and structural differences. Collect results on spreadsheets. Generate radar diagrams.
	produce initial design criteria;	Produce list of criteria which reflects research and views of others.
	generate ideas for new food products including products for various ages, cultures and dietary needs;	Identify target group or dietary need and produce sketches, diagrams, pictures etc. using a range of techniques including CAD.
	develop food product prototype;	Develop initial ideas.
	use CAD to model nutritional profiles for product;	Use nutritional analysis to evaluate developments in line with specification.
	carry out modification and reformulation;	Use investigations, testing and adaptations to shape, size, finish, ingredients, processes, weight volume, taste, texture etc.
	carry out sensory evaluation, i.e. product profile, difference tests, ranking, test marketing against original specification;	Carry out sensory analysis techniques, e.g. tests to identify/determine key characteristics.

	<b>Candidates should:</b>	<b>Possible learning experiences</b>
	<p>apply quality control procedures for manufacturing;</p> <p>understand risk assessment;</p>	<p>Produce a quality control checklist.</p> <p>Produce a HACCP procedure for the prototype.</p>
<b>11.7</b>	<p><b>Understand a food production system, applying appropriate checking procedures in order to provide feedback, monitor performance and ensure quality control</b></p> <p>identify ‘input, process and output’ and the stages at which feedback would be given in food production;</p> <p>use CAD to simulate a manufacturing procedure;</p> <p>devise a flowchart of a system for monitoring a food product cycle;</p>	<p>Watch video and identify each aspect of the production system.</p> <p>Use computer software to generate a HACCP procedure for a product prototype.</p> <p>Illustrate system through the production of a flow chart or computer simulation and relate to commercial system, e.g. fast food outlet, bakery.</p>
<b>11.8</b>	<p><b>Labelling information, legislation and codes of practice</b></p> <p>understand the requirements for conveying information to the end user, including the function of CAD for modelling packaging information;</p>	<p>Compile the required data/instructions/information for a specified food product, including the use of nutritional analysis software.</p>
<b>11.9</b>	<p><b>Awareness of the social and economic implications of food production and processing technology including application of nutritional knowledge and appropriate use of resources</b></p> <p>use computer analysis of nutritional data to study the effect of food products on health;</p> <p>distinguish between quality of design and quality of manufacture;</p> <p>evaluate a range of existing packaging materials in relation to the preparation, cooking and storage of food products and their impact on product cost and the environment;</p> <p>consider the need, function and effect of ‘smart’ materials.</p>	<p>Assess food products for their nutritional content. Make suggestions for modification.</p> <p>Evaluate outcome against intended specification and design criteria.</p> <p>Assess suitable material for retention of heat or moisture.</p> <p>Identify where or why modified starch would be used.</p>

## Food Processes and Product Manufacture

Candidates should know and understand that food products are developed by combining ingredients and/or components and by using a range of techniques, processes and equipment.

	<b>Candidates should:</b>	<b>Possible learning experiences</b>
<b>11.10</b> The effect of combining different ingredients and the interaction of foods during preparation and cooking	combine foods for designated outcome in terms of consistency, volume, texture, flavour;	Product development, e.g. different ingredients/quantities and method of production of sauces, e.g. roux, blended, salad dressing.
<b>11.11</b> The importance of appropriate proportions on the structure, shape and volume of mixtures	demonstrate how accurate measurement, ratio and proportioning affect preparation, making and shaping of products to designated criteria;	Adaptation of amounts in mixtures, e.g. liquid in bread, fat in pastry.
	select and use standard components for maintaining quality of outcome;	Demonstrate use of standard components, e.g. stock cube, salad dressing, fondant icing in own product development.
<b>11.12</b> The use of equipment for a particular task or process to produce a consistent result in both test kitchen and industrial production	use a range of hand/electrical/mechanical equipment for a specific purpose or desired effect;	e.g. cutting, agitation, reduction of time, effort or skill.
	demonstrate ability to work to designated tolerances to ensure consistency of outcome;	Roll pastry to appropriate and even thickness.
	understand how CAM develops a standard outcome;	Use pre-programmed bread maker to replicate products.
<b>11.13</b> Preparation and preservation methods that affect quality and storage of food products	understand the reasons for the changes which occur in foods and food products during freezing and chilling.	Evaluate a range of frozen food for sensory characteristics.

## Key Skills and Other Issues

12

### Key Skills – Teaching, Developing and Providing Opportunities for Generating Evidence

#### 12.1 Introduction

The Key Skills Qualification requires candidates to demonstrate levels of achievement in the Key Skills of *Application of Number, Communication and Information Technology*.

The units for the ‘wider’ Key Skills of *Improving own Learning and Performance, Working with Others* and *Problem-Solving* are also available. The acquisition and demonstration of ability in these ‘wider’ Key Skills is deemed highly desirable for all candidates, but they do not form part of the Key Skills Qualification. Design and Technology, however, does offer a unique opportunity for candidates to provide evidence for all six Key Skills.

Copies of the Key Skills Units may be downloaded from the QCA Website (<http://www.qca.org.uk/keyskills>).

The units for each Key Skill comprise three sections:

- A What you need to know.
- B What you must do.
- C Guidance.

Candidates following a course of study based on this Specification for Design and Technology (Food Technology) can be offered opportunities to develop and generate evidence of attainment in aspects of the Key Skills of *Application of Number, Communication, Information Technology, Improving own Learning and Performance, Working with Others* and *Problem-Solving*. Areas of study and learning that can be used to encourage the acquisition and use of Key Skills, and to provide opportunities to generate evidence for Part B of the units, are signposted below.

#### 12.2 Key Skills Opportunities in Design and Technology (Food Technology)

The broad and multi-disciplinary nature of Design and Technology makes it an ideal vehicle to help candidates develop their knowledge and understanding of all Key Skills and to produce evidence of their application. It should be noted that, while *Working with Others* is an important aspect of Design and Technology, the work candidates submit for coursework assessment must be their own.

### Application of Number Level 1

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
<b>N1.1</b> Interpret information from different sources	9.1, 10.3, 10.6, 11.3, 11.6
<b>N1.2</b> Carry out calculations	10.11, 11.11
<b>N1.3</b> Interpret results and present findings	9.1, 10.3, 11.3

### Application of Number Level 2

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
<b>N2.1</b> Interpret information from different sources	9.1, 10.3, 10.6, 11.3, 11.6
<b>N2.2</b> Carry out calculations	10.11, 11.11
<b>N2.3</b> Interpret results and present findings	9.1, 10.3, 11.3

### Communication Level 1

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
<b>C1.1</b> Take part in discussions	9.1, 10.5, 11.5
<b>C1.2</b> Read and obtain information	9.1, 10.1 - 10.14, 11.1 - 11.14
<b>C1.3</b> Write different types of documents	9.1, 10.3, 10.5, 11.3, 11.5



**Communication Level 2**

<b>What you must do ...</b>	<b>Signposting of Opportunities for Generating Evidence in Subject Content</b>
<b>C2.1a</b> Contribute to discussions	9.1, 10.5, 11.5
<b>C2.1b</b> Give a short talk	10.5, 10.9, 11.5, 11.9
<b>C2.2</b> Read and summarise information	9.1, 10.1 - 10.14, 11.1 - 11.14
<b>C2.3</b> Write different types of documents	9.1, 10.2, 10.5, 10.6, 10.14, 11.5, 11.6, 11.14

**Information Technology Level 1**

<b>What you must do ...</b>	<b>Signposting of Opportunities for Generating Evidence in Subject Content</b>
<b>IT1.1</b> Find, explore and develop information	9.1, 10.7, 10.13, 11.7, 11.13
<b>IT1.2</b> Present information, including text, numbers and images	9.1, 10.6, 11.6

**Information Technology Level 2**

<b>What you must do ...</b>	<b>Signposting of Opportunities for Generating Evidence in Subject Content</b>
<b>IT2.1</b> Search for and select information	9.1, 10.7, 10.13, 11.7, 11.13
<b>IT2.2</b> Explore and develop information and derive new information	9.1, 10.7, 10.13, 11.7, 11.13
<b>IT2.3</b> Present combined information, including text, numbers and images	9.1, 10.6, 11.6

### Working with Others Level 1

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
<b>WO1.1</b> Confirm what needs to be done and who is to do it	9.1, 10.9, 11.9
<b>WO1.2</b> Work towards agreed objectives	9.1, 10.9, 11.9
<b>WO1.3</b> Identify progress and suggest improvements	9.1

### Working with Others Level 2

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
<b>WO2.1</b> Plan work and confirm working arrangements	9.1, 10.9, 11.9
<b>WO2.2</b> Work cooperatively towards achieving identified objectives	9.1, 10.9, 11.9
<b>WO2.3</b> Exchange information on progress and agree ways of improving work with others	9.1

### Improving own Learning and Performance Level 1

What you must do ...	Signposting of Opportunities for Generating Evidence in Subject Content
<b>LP1.1</b> Confirm, short term targets and plan how these will be met	9.1, 10.5, 11.5
<b>LP1.2</b> Follow plan to meet targets and improve performance	9.1, 10.9, 11.9
<b>LP1.3</b> Review progress and achievement.	9.1, 10.9, 10.12, 11.9, 11.12

**Improving Own Learning and Performance Level 2**

<b>What you must do ...</b>	<b>Signposting of Opportunities for Generating Evidence in Subject Content</b>
<b>LP2.1</b> Help set short-term targets and plan how these will be met	9.1, 10.5, 11.5
<b>LP2.2</b> Use plan and support from others, to meet targets	9.1
<b>LP2.3</b> Review progress and identify evidence of achievements	9.1, 10.9, 10.12, 11.9, 11.12

**Problem Solving Level 1**

<b>What you must do ...</b>	<b>Signposting of Opportunities for Generating Evidence in Subject Content</b>
<b>PS1.1</b> Confirm understanding of given problems	9.1, 10.1 – 10.15, 11.1 – 11.15
<b>PS1.2</b> Plan and try out ways of solving problems	9.1, 10.1 – 10.15, 11.1 – 11.15
<b>PS1.3</b> Check if problems have been solved and describe the results	9.1, 9.2, 10.6, 11.6

**Problem Solving Level 2**

<b>What you must do ...</b>	<b>Signposting of Opportunities for Generating Evidence in Subject Content</b>
<b>PS2.1</b> Identify problems and come up with ways of solving them	9.1, 10.1 – 10.15, 11.1 – 11.15
<b>PS2.2</b> Plan and try out options	9.1, 10.1 – 10.15, 11.1 – 11.15
<b>PS2.3</b> Apply given methods to check if problems have been solved and describe the results	9.1, 10.6, 11.6

### 12.3 Further Guidance

More specific guidance and examples of tasks that can provide evidence of single Key Skills, or composite tasks that can provide evidence of more than one Key Skill are given in the AQA specification support material, particularly the Teachers' Guide.

## 13

## Spiritual, Moral, Ethical, Social, Cultural and Other Issues

- |   |   |
|---|---|
| 13.1 Spiritual, Moral, Ethical, Social, Cultural and Other Issues | The study of Design and Technology should contribute substantially to candidates' understanding of moral, ethical, social and cultural issues. Such issues underlie all design and manufacturing activities and are explicitly referred to in Sections 9.1-11.13 of the Subject Content. These issues will be tested in both coursework and the written paper.  |
| 13.2 European Dimension   | AQA has taken account of the 1988 Resolution of the Council of the European Community in preparing this specification and associated specimen papers.   |
| 13.3 Environmental Issues   | AQA has taken account of the 1988 Resolution of the Council of the European Community and the Report " <i>Environmental Responsibility: An Agenda for Further and Higher Education</i> " 1993 in preparing this specification and associated specimen papers.<br><br>Environmental considerations are important to the development of all designs and products. Awareness of these issues is specifically required in all sections of the Subject Content and will be tested in both components. See Section 15 for details of coursework requirements.   |
| 13.4 Citizenship  | In the Key Stage 4 programme of study for Citizenship, <i>Developing skills of enquiry and communication</i> (Section 2) and <i>Developing skills of participation and responsible action</i> (Section 3) naturally parallel candidates' actions and approaches during project work. For example, the effects of certain products or manufacturing systems on society and the individual are matters of interest in design and technology, but they also touch on Section 2(a) of the programme of study. Similarly, the designer needs to empathise with the end user (Section 3(a)) and in the process of designing needs to negotiate with clients or during market research to determine and achieve the desired ends (Section 3(b)). |
| 13.5 Avoidance of Bias  | AQA has taken great care in the preparation of this specification and associated specimen papers to avoid bias of any kind.   |
| 13.6 Health and Safety  | Health and safety impinges on all aspects of Design and Technology and requires consideration in terms of the maker, the manufacturer, the individual user and society at large. Health and safety and related issues should therefore be an integral part of all teaching. They are expected to be considered in the coursework and will be tested in the written paper.   |

## Centre-Assessed Component

14

### Nature of the Centre-Assessed Component

#### 14.1 The nature of Design and Technology

The distinguishing feature of any design and technology course is its practical nature. Knowledge and understanding is not therefore to be acquired purely for its own sake, but in order to satisfy the needs of clients and consumers, and the constraints placed on manufacturers in industrial and commercial contexts.

For Food Technology candidates will need to be familiar with a wide variety of materials and the use of CAD/CAM in production.

Underpinning all learning are the designing and making skills which make use of knowledge and understanding in order to produce outcomes which satisfy a design brief.

#### Designing

Designing is a process based activity involving the progressive engagement with a problem which requires thinking, creating, inventing, predicting, experimenting, decision making, constant evaluation and, where necessary, modification. Designers develop an awareness of the opportunities and constraints placed upon them by taking account of the demands of users and producers, market forces and the effects their products can have on society and the environment.

The activities detailed above draw upon relevant skills and knowledge which are enriched by the application of human values.

#### Making

The realisation of design ideas and solutions to problems is achieved by making products where a range of materials and media may be used. In design and technology, making activities may take many forms, ranging through early experimentation, testing and trials to a final marketable product. All the aspects detailed above provide opportunities for students to develop making skills as they seek to produce high quality outcomes.

#### Communication

Communication is an integral aspect of the whole process and it plays three major roles in any design and technology activity.

First, it enables the designer to visualise ideas and thoughts which permit detailed analysis. Second, it provides a record which can be referred to, adapted or refined as the process progresses. Third, it provides an explanation for others of the development of ideas from the mind to the outcome.

The range of communication methods is wide and becoming wider through the increasing use of ICT. All or any should be used *as appropriate to the task in hand* – notes, sketches, formal drawings, photographs, computer programs, oral communication and two or three dimensional representations are all relevant in particular circumstances.

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#### 14.2 The Coursework Project (Full and Short Courses)

Candidates are required to submit a single integrated project which consists of a *concise* design folder and or appropriate ICT evidence and a food product prototype(s). The whole activity should not exceed 40 hours for the full course or 20 hours for the short course.

GCSE Design and Technology involves increased emphasis on the industrial aspects of designing and making, particularly in the use of CAD/CAM, and on the wider effects of technological activity on society and the environment. These elements should therefore be evident in candidates' projects.

Candidates wishing to work with others may do so. Centres must ensure, however, that candidates select appropriate projects and provide individual and separate evidence of their own ability to design and make a quality product from start to finish.

Candidates may use the Board-set project outlines given in paragraph 15.2 below, formulate their own briefs or use briefs set by the centre. The centre is responsible for ensuring candidates attempt projects which satisfy the coursework requirements (see Section 16 below).

Candidates may enter for any other GCSE specification at the same sitting. However the submission of the same piece of coursework for more than one specification is prohibited.

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#### 14.3 The Short Course Project

Quality designing and quality making are requirements for any Design and Technology project. With only 20 hours available for short course projects, however, it becomes particularly important that candidates use their time in the most profitable and effective way. The following advice is given to help teachers and candidates, but teachers will find fuller guidance in the Teachers' Guide.

The identification of a suitable task is a crucial factor in managing the short course project. Candidates undertaking short course projects should be guided by teachers to smaller, more focused or less complex problems than might be expected for a full course project. It should be noted, however, that the requirement for *quality* work is the same as for the full course, regardless of the scale of the work.

Candidates may use the Board-set project outlines given in paragraph 15.2 below, formulate their own briefs or use briefs set by the centre. The centre is responsible for ensuring candidates attempt projects which satisfy the coursework requirements (see Section 15 below).

Time management is another important element for successful short course projects. It is recommended that, before the project period

begins, teachers provide a time plan for candidates, which allows realistic and proportionate time for the various stages and activities.

Time spent on an initial analysis of the problem will help to reduce or eliminate wasteful, unfocused research. Focused research can in turn reduce the time needed for a careful analysis.

Short course candidates are not expected to generate the same quantity of ideas as full course candidates, although the same level of creative ideas is still expected. The more focused analysis and research should help in producing a workable design solution more quickly.

Making skills represent two-thirds of the project marks and this should have been taken into account in the pre-planning stage. A quality product is still expected, but it does not need to be large or complex to gain high marks. The product does need, however, to include a variety of skills, techniques and/or processes that are completed to a high standard, and which overall satisfy the design objectives.

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## 15

# Guidance on Setting the Centre-Assessed Component

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### 15.1 Project Outlines

Project outlines are given in para 15.2 for Design and Technology (Food Technology) full and short courses. Centres may use these or adapt them to meet the needs of their candidates. Centres wishing to develop their own outlines for candidates should take note of the following guidelines.

The aim of a project outline should be to enable candidates to design and make a saleable food product. Candidates should address packaging requirements but it is not a requirement of the specification to make the packaging.

The checklist below is given to help teachers ensure that the project outlines they prepare will meet both the needs of candidates and the requirements of the specification. Prior approval of centre devised project outlines is not required.

- a. Does the outline encourage an integrated approach to designing and making and represent a *level of demand* appropriate to the individual candidate's ability?
- b. Has the outline or problem been so written that candidates will be able to demonstrate the highest level of their ability in each Assessment Objective?
- c. Where a single outline, e.g. design and make a special diet, is to be presented to a number of candidates covering a wide ability range, has



each candidate produced a brief for him/herself that will be challenging, but not daunting?

- d. • Does the project outline offer scope for candidates to consider:
- the effects and implications of technological activity (e.g. industrial, social, moral, cultural, economic, environmental factors);
  - systems and control;
  - provision for product maintenance;
  - repetition skills (e.g. multiple production);
  - use of CAD/CAM and ICT skills in general;
  - product quality;
  - health and safety in relation to the maker and others?
- e. Are the resources, equipment, tools, materials and media available for the potential demands of the project?
- f. Can the project be completed satisfactorily in 40 hours for the full course and 20 hours for the short course?
- g. Will the task permit sufficient supervision to enable the teacher to certify that the candidate's work is his/her own?

Where candidates work with others, it must be possible to identify the individual contribution of each candidate, so that the requirements in the specification are met.

- h. Is the project outline free from political, ethnic, gender and other forms of bias?

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## 15.2 Project Outlines

The following list of possible projects is provided as a starting point for candidates. Candidates may use these, adapt them or devise their own.

### Full Course

1. Design and make a cook-chill product.
2. Design and make a special diet product which could be sold in a major food retail outlet.
3. Design and make a vegetarian main course product.
4. Design and make a frozen low cost meal for one.
5. Design and make a 'ready to eat' dessert which could be sold in a major food retail outlet.
6. Design and make a packed lunch product which could be individually packaged for sale.
7. Design and make a low fat product.
8. Design and make a low calorie meal for one.

9. Design and make a high energy bar.
10. Design and make a product which could be sold within a party pack of multicultural foods.
11. Design and make an interesting carbohydrate accompaniment for a main meal product.
12. Design and make a healthy option cake which could be sold boxed from a supermarket.

#### Short Course

1. Design and make a biscuit which could be sold as part of a packed meal.
2. Design and make a cook-chill main course soup product.
3. Design and make a one pot dessert.
4. Design and make a one pot salad and dressing.
5. Design and make a potato topping which would be sold to add to/cover a base of meat, fish or vegetables.
6. Design and make a sauce product which could be sold for addition to pasta, meat or vegetables.
7. Design and make a topping which could be used with fruit to produce a healthy option dessert.
8. Design and make a savoury filling which could be used to stuff vegetables for a vegetarian main course product.

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#### 15.3 Support Material

Further examples of project outlines are included in the *Teachers' Guide*. Other material to support teachers will be produced for the annual teachers' meetings in the Autumn Term.

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#### 15.4 Coursework Advisers

Coursework Advisers will be available to assist centres with any matters relating to coursework. Details will be provided when AQA knows which centres are following the specification.

## 16

# Assessment Criteria

## 16.1 Introduction

Teachers are required to determine grades separately for the designing and making elements of their candidates' coursework. To do this they must use their professional judgement in conjunction with the Assessment Criteria given in 16.3 below.

The level of demand of a design brief should influence the interpretation of the criteria. A successful project which makes great demands on skills, cognitive abilities and breadth and depth of knowledge should be more highly rewarded than a successful project with fewer demanding aspects. This applies equally to the Full and Short Course projects, but in the context of the different times available for their completion.

Quality of work is more important than quantity and size. For this reason no estimate of the number of pages in a design folio or of the size and complexity of the product is given. Candidates should, however, plan to produce **concise** design folders and a food product prototype(s) which can reasonably be completed, in total, in no more than 40 hours for the full course and 20 hours for the short course. Candidates who do not complete their projects will be assessed on what they submit.

Candidates wishing to work with others may do so. Centres must ensure, however, that candidates select appropriate projects and provide individual and separate evidence of their own ability to design and make a quality product from start to finish.

The Assessment Criteria give guidance on the expected levels of achievement in Designing Skills and Making Skills for grades G-A. Teachers should note that A\* does not feature as a coursework grade. A\* grades are determined arithmetically on the total marks gained for the examination and are available only for candidates who have taken a Higher Tier paper.

As in any holistic assessment, a weak performance in one aspect of a candidate's work may be balanced by a strong performance in another. The principle of "best fit" should be applied when using these criteria.

An assessment of the quality of written communication in the design folder is to be made according to the criteria given in 16.4.

Centres are strongly recommended to provide candidates with feedback as their work progresses. This can not only encourage or reward the candidates, but it can also ease the assessment burden on teachers at the end of the coursework period.

Teachers should not record their comment on candidates' work; any written comments should be recorded on the Candidate Record Form.

## 16.2 Assessment Procedure

An assessment of a candidate's coursework should follow the pattern given below.

- a. Guided by the criteria, assess the Designing Skills in terms of a whole grade, e.g. Grade C.
- b. Refine that decision to High (H), Middle (M) or Low (L). A candidate only just achieving the required standard should be given the lowest assessment in the grade, (L), while a candidate just failing to reach the grade above should be given the highest in the grade (H).
- c. Repeat a. and b. above for Making Skills.
- d. Record the refined grade for Designing (e.g. High B = HB) and the refined grade for Making (e.g. Mid E = ME) on page 4 of the Candidate Record Form.
- e. Using the *Project Assessment Matrix* (Appendix E), derive from the two grade decisions a single mark. For example, a High B for Designing and a Mid E for Making will produce a mark of 52.
- f. Record the mark derived from the matrix in the space on page 4.
- g. Using the criteria below, make an overall assessment of candidates' completed design folders for the quality of written communication (QWC) and determine a mark out of a maximum of 5 marks.
- h. Record the QWC mark in the space provided on page 4.
- i. Add together the Matrix mark and the QWC mark and write the total out of 95 in the Total Mark box.
- j. The total mark for each candidate is to be recorded on the AQA mark sheet which will be sent to centres in the Spring Term.

**16.3 Assessment Criteria Candidates will have:**

Grade	Designing	Making
<b>G</b>	<ol style="list-style-type: none"> <li>gathered minimal research information;</li> <li>provided little evidence of analysis of task or research;</li> <li>produced a simple specification;</li> <li>produced a solution, with rudimentary forward planning;</li> <li>attempted a superficial evaluation of the outcome of their work;</li> <li>demonstrated very limited communication, graphical and ICT skills;</li> <li>provided little or no evidence of having considered industrial practices and systems and control.</li> </ol>	<ol style="list-style-type: none"> <li>used materials, components and equipment safely under close supervision;</li> <li>produced references to the use of CAM where appropriate;</li> <li>produced an undemanding or incomplete outcome;</li> <li>some evidence of QA and QC.</li> </ol>
<b>F</b>	<ol style="list-style-type: none"> <li>used more than one source to gather research information;</li> <li>made a limited attempt to analyse the task and the research material;</li> <li>produced a generalised specification;</li> <li>produced at least two proposals which satisfy parts of the specification;</li> <li>used a proposal to produce the outcome with little development and forward planning;</li> <li>superficially tested and evaluated their work against original intentions;</li> <li>demonstrated limited communication, graphical and ICT skills;</li> <li>provided limited evidence of having considered industrial practices and systems and control.</li> </ol>	<ol style="list-style-type: none"> <li>used materials, components and equipment correctly and safely (including CAM if appropriate);</li> <li>produced a largely complete but undemanding outcome;</li> <li>demonstrated accuracy and finish in some parts of the product;</li> <li>produced evidence of some QA and QC.</li> </ol>
<b>E</b>	<ol style="list-style-type: none"> <li>used a limited number of sources to gather research information;</li> <li>made a superficial analysis of the task and most of the research material;</li> <li>produced a specification which reflects the most obvious features of the analysis;</li> <li>produced some proposals which satisfy most of the specification;</li> <li>used their proposals and relevant knowledge to produce a solution which satisfies most of the specification;</li> <li>demonstrated some forward planning;</li> <li>tested and evaluated some aspects of their work;</li> <li>used some appropriate communication, graphical and ICT skills to convey design ideas;</li> <li>provided limited evidence of having considered industrial practices and systems and control.</li> </ol>	<ol style="list-style-type: none"> <li>corrected working errors where necessary;</li> <li>used materials, components, equipment and processes correctly and safely (including CAM if appropriate);</li> <li>produced a largely complete and largely effective outcome;</li> <li>demonstrated a fair degree of accuracy and finish in the overall product;</li> <li>applied QA and QC broadly but superficially.</li> </ol>
<b>D</b>	<ol style="list-style-type: none"> <li>used several appropriate sources to gather relevant research information;</li> <li>made a simple analysis of the task and all research material;</li> <li>produced a specification which reflects most of the analysis;</li> <li>produced several proposals which satisfy the specification;</li> <li>used their proposals and relevant knowledge to develop a solution which satisfies the specification;</li> <li>planned sequence of making activities;</li> <li>tested and evaluated most aspects of their work and made some appropriate modifications;</li> <li>used appropriate communication, graphical and ICT skills to convey design ideas;</li> <li>provided limited evidence of having considered relevant industrial practices and systems and control.</li> </ol>	<ol style="list-style-type: none"> <li>appropriately corrected working errors;</li> <li>used appropriate materials, components, equipment and processes correctly and safely (including CAM);</li> <li>produced an effective and largely complete outcome;</li> <li>demonstrated a reasonable level of accuracy and finish in the product;</li> <li>applied QA and QC broadly.</li> </ol>

**Candidates will have:**

Grade	Designing	Making
<b>C</b>	<ol style="list-style-type: none"> <li>used a variety of appropriate sources to gather and order relevant research information;</li> <li>analysed the task and the research material;</li> <li>produced a specification which reflects the analysis;</li> <li>produced a range of proposals which satisfy the specification;</li> <li>used their proposals and relevant knowledge to develop a detailed design solution which satisfies the specification;</li> <li>planned a largely correct, and workable, sequence of main making activities;</li> <li>tested, evaluated and modified their work throughout the process as appropriate;</li> <li>used a range of communication, graphical and ICT skills sufficient to convey ideas to themselves and others;</li> <li>provided evidence of having considered relevant issues, industrial practices and systems and control.</li> </ol>	<ol style="list-style-type: none"> <li>recognised the need for and justified any changes or adaptations;</li> <li>used appropriate materials, components, tools, equipment and processes (including CAM) correctly and safely;</li> <li>produced a complete, effective and well-assembled outcome;</li> <li>demonstrated a level of accuracy and finish in the product which satisfies most of the demands of the design solution;</li> <li>clearly used QA and QC to control quality in most activities.</li> </ol>
<b>B</b>	<ol style="list-style-type: none"> <li>produced a well ordered and relevant range of appropriate research information;</li> <li>thoroughly analysed the task and research material;</li> <li>produced a detailed specification closely reflecting the analysis;</li> <li>produced a wide range of proposals which satisfy the specification;</li> <li>used their proposals and relevant knowledge of techniques, manufacturing and working characteristics of materials to develop a detailed design solution;</li> <li>planned the correct sequence of making activities;</li> <li>tested, evaluated and modified their work throughout the process as appropriate;</li> <li>used an appropriate range of communication, graphical and ICT skills sufficient to convey ideas to themselves and others effectively;</li> <li>provided evidence of having considered relevant issues, industrial practices and systems and control.</li> </ol>	<ol style="list-style-type: none"> <li>recorded and justified the need for any changes or adaptations;</li> <li>used appropriate materials, components, tools, equipment and processes (including CAM) skilfully, correctly and safely;</li> <li>made a complete, effective and skilfully-produced outcome;</li> <li>demonstrated a level of accuracy and finish in the product which satisfies the demands of the design solution;</li> <li>provided evidence of QA &amp; QC throughout manufacture.</li> </ol>
<b>A</b>	<ol style="list-style-type: none"> <li>used a wide variety of appropriate sources to gather relevant research information;</li> <li>analysed the task and the research material logically, thoroughly and effectively;</li> <li>produced a detailed specification which focuses closely on the analysis;</li> <li>produced a wide range of distinct proposals which satisfy the specification;</li> <li>used one or more of their proposals and relevant knowledge of techniques, manufacturing and working characteristics to develop a detailed and coherent design solution;</li> <li>produced a correct sequence of activities which shows where, why and how practical production decisions were made;</li> <li>tested, objectively evaluated and effectively modified their work throughout the process as appropriate;</li> <li>selected and skilfully used a wide range of communication, graphical and ICT skills which have helped to clarify their thinking and are sufficient to convey ideas to themselves and others effectively and precisely;</li> <li>provided evidence that they have considered and taken account of relevant issues, industrial practices and systems and control.</li> </ol>	<ol style="list-style-type: none"> <li>recorded and justified the need for any changes or adaptations;</li> <li>used appropriate materials, components, equipment and processes (including CAM) consistently correctly, skilfully and safely;</li> <li>made a complete product of high quality;</li> <li>demonstrated an ability to satisfy accurately and completely all the demands of the design solution;</li> <li>thoroughly considered QA &amp; QC and applied them consistently and successfully.</li> </ol>

**16.4 Quality of Written Communication**

An assessment for the quality of written communication shown in the completed design folder is to be made separately from the designing grade. Use the criteria given below and record the mark on the Candidate Record Form.

**Marks**

- 4-5 Information is clearly and logically presented using an appropriate form. The text is legible. Candidates spell, punctuate and use the rules of grammar accurately, enabling the meaning to be clearly understood.
- 2-3 Information is presented in an appropriate form. The text is legible. Candidates generally spell, punctuate and use the rules of grammar accurately, although there may be some errors. The meaning is clear.
- 1 Some of the information presented is in an appropriate form. Generally the text is legible. Although there are errors in spelling, punctuation and grammar, candidates' meaning can be understood.
- 0 Candidates have failed to reach the standard required for the award of a mark.

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**16.5 Evidence to Support the Award of Marks**

Teachers should keep records of their assessments during the course, in a form which facilitates the complete and accurate submission of the final assessments at the end of the course.

When the assessments are complete, the marks awarded under each of the assessment criteria must be entered on the Candidate Record Form, with supporting information given in the spaces provided. A specimen Candidate Record Form can be found on the AQA website; the exact design may be modified before the operational version is issued and the correct year's Candidate Record Forms should always be used.

## Supervision and Authentication

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- 17.1 Supervision of Candidates' Work** Candidates' work for assessment must be undertaken under conditions which allow the teacher to supervise the work and enable the work to be authenticated. If it is necessary for some assessed work to be done outside the centre, sufficient work must take place under direct supervision to allow the teacher to authenticate each candidate's whole work with confidence.
- 
- 17.2 Guidance by the Teacher** The work assessed must be solely that of the candidate concerned.
- The Coursework Project is, however, as much a vehicle for teaching as for assessment. It is therefore expected that the teacher will need to give advice and assistance to individual candidates as part of normal teaching. This should be provided, but normally in such a way that candidates have alternative possibilities to explore, and their own decisions to make about accepting or using the information or advice provided by the teacher. There may, of course, be occasions when direct teacher intervention is necessary to ensure safety, to prevent costly waste of materials or to provide a less able candidate with positive assistance.
- In any case where assistance given to an individual candidate goes beyond normal teaching, details must be recorded on the Candidate Record Form and taken into account in the assessment of coursework.
- 
- 17.3 Unfair Practice** At the start of the course, the supervising teacher is responsible for informing candidates of the AQA Regulations concerning malpractice. Candidates must not take part in any unfair practice in the preparation of coursework to be submitted for assessment, and must understand that to present material copied directly from books or other sources without acknowledgement will be regarded as deliberate deception. Centres must report suspected malpractice to AQA. The penalties for malpractice are set out in the AQA Regulations.
- 
- 17.4 Authentication of Candidates' Work** Both the candidate and the teacher are required to sign declarations confirming that the work submitted for assessment is the candidate's own. The teacher declares that the work was conducted under the specified conditions, and records details of any additional assistance.



## 18

## Standardisation

### 18.1 Standardising Meetings

Annual standardising meetings will usually be held in the autumn term. Centres entering candidates for the first time must send a representative to the meetings. Attendance is also mandatory in the following cases:

- where there has been a serious misinterpretation of the specification requirements;
- where the nature of coursework tasks set by a centre has been inappropriate;
- where a significant adjustment has been made to a centre's marks in the previous year's examination.

After the first year, attendance is at the discretion of centres. At these meetings support will be provided for centres in the development of appropriate coursework tasks and assessment procedures.

### 18.2 Internal Standardisation of Marking

The centre is required to standardise the assessments across different teachers and teaching groups to ensure that all candidates at the centre have been judged against the same standards. If two or more teachers are involved in marking a component, one teacher must be designated as responsible for internal standardisation. Common pieces of work must be marked on a trial basis and differences between assessments discussed at a training session in which all teachers involved must participate. The teacher responsible for standardising the marking must ensure that the training includes the use of reference and archive materials such as work from a previous year or examples provided by AQA. The centre is required to send to the moderator the Centre Declaration Sheet, duly signed, to confirm that the marking of centre-assessed work at the centre has been standardised. If only one teacher has undertaken the marking, that person must sign this form.

## Administrative Procedures

### 19.1 Recording Assessments

The candidates' work must be marked according to the assessment criteria set out in paragraphs 16.3 and 16.4. The marks and supporting information must be recorded in accordance with the instructions in paragraph 16.5. The completed Candidate Record Form for each candidate must be attached to the work and made available to AQA on request.

At the beginning of the course, centres are required to inform the AQA of the approximate number of candidates to be entered for the examination so that the appropriate number of Candidate Record Forms may be sent.

### 19.2 Submitting Marks and Sample Work for Moderation

The total component mark for each candidate must be submitted to AQA on the mark sheets provided or by Electronic Data Interchange (EDI) by the specified date. Centres will be informed which candidates' work is required in the samples to be submitted to the moderator.

### 19.3 Factors Affecting Individual Candidates

Teachers should be able to accommodate the occasional absence of candidates by ensuring that the opportunity is given for them to make up missed assessments.

Special consideration should be requested for candidates whose work has been affected by illness or other exceptional circumstances. Information about the procedure is issued separately.

If work is lost, AQA should be notified immediately of the date of the loss, how it occurred, and who was responsible for the loss. AQA will advise on the procedures to be followed in such cases.

Where special help which goes beyond normal learning support is given, AQA must be informed so that such help can be taken into account when assessment and moderation take place.

Candidates who move from one centre to another during the course sometimes present a problem for a scheme of internal assessment. Possible courses of action depend on the stage at which the move takes place. If the move occurs early in the course the new centre should take responsibility for assessment. If it occurs late in the course it may be possible to accept the assessments made at the previous centre. Centres should contact AQA at the earliest possible stage for advice about appropriate arrangements in individual cases.

#### 19.4 Retaining Evidence and Re-Using Marks

The centre must retain the work of all candidates, with Candidate Record Form attached, under secure conditions, from the time it is assessed, to allow for the possibility of an enquiry upon results. The work may be returned to candidates after the issue of results provided that no enquiry upon result is to be made which will include re-moderation of the coursework component. If an enquiry upon result is to be made, the work must remain under secure conditions until requested by AQA.

Candidates repeating the examination may carry forward their moderated mark for the coursework component once only and within a twelve month period.

## 20

## Moderation

### 20.1 Moderation Procedures

Moderation of the coursework is by inspection of a sample of candidates' work, sent by post from the centre to a moderator appointed by AQA. The centre marks must be submitted to AQA and the sample of work must reach the moderator by the specified date in the year in which the qualification is awarded.

Following the re-marking of the sample work, the moderator's marks are compared with the centre marks to determine whether any adjustment is needed in order to bring the centre's assessments into line with standards generally. In some cases it may be necessary for the moderator to call for the work of other candidates. In order to meet this possible request, centres must have available the complete coursework and Candidate Record Form of every candidate entered for the examination and be prepared to submit it on demand. Mark adjustments will normally preserve the centre's order of merit, but where major discrepancies are found, AQA reserves the right to alter the order of merit.

### 20.2 Post-Moderation Procedures

On publication of the GCSE results, the centre is supplied with details of the final marks for the coursework component.

The candidates' work is returned to the centre after the examination with a report form from the moderator giving feedback to the centre on the appropriateness of the tasks set, the accuracy of the assessments made, and the reasons for any adjustments to the marks.

Some candidates' work may be retained by AQA for archive purposes.

## Awarding and Reporting

### 21 Grading, Shelf-Life and Re-Sits

- 21.1 Qualification Titles** The qualifications based on this specification have the following titles: AQA General Certificate of Secondary Education in Design and Technology (Food Technology); AQA General Certificate of Secondary Education in Design and Technology (Food Technology) Short Course.
- 21.2 Grading System** Both the full course and short course qualifications will be graded on an 8 point grade Scale A\*, A, B, C, D, E, F, G. Candidates who fail to reach the minimum standard for grade G will be recorded as U (unclassified) and will not receive a qualification certificate.
- Candidates must be entered for either the Foundation Tier or Higher Tier. For candidates entered for the Foundation Tier, grades C–G are available. For candidates entered for the Higher Tier A\*–D are available. There is a safety net for candidates entered for the Higher Tier, where an allowed Grade E will be awarded where candidates just fail to achieve Grade D. Candidates who fail to achieve a Grade E on the Higher Tier or Grade G on the Foundation Tier will be reported as unclassified.
- 21.3 Re-Sits** Individual components may not be retaken, but candidates may retake the whole qualification more than once.
- 21.4 Minimum Requirements** Candidates will be graded on the basis of work submitted for assessment.
- 21.5 Carrying Forward of Centre-Assessed Marks** Candidates re-taking the examination may carry forward their moderated coursework marks. These marks have a shelf-life which is limited only by the shelf-life of the specification, and they may be carried forward an unlimited number of times within this shelf-life.
- 21.6 Awarding and Reporting** The regulatory authorities, in consultation with GCSE awarding bodies, developed a Code of Practice for GCSE qualifications which were introduced in September 2000. This specification complies with the grading, awarding and certification requirements of the current GCSE, GCE, GNVQ and AEA Code of Practice April 2008 and will be revised in the light of any subsequent changes for future years.

# Appendices

## A

### Grade Descriptions

The following grade descriptors indicate the level of attainment characteristic of the given grade at GCSE. They give a general indication of the required learning outcomes at each specific grade. The descriptors should be interpreted in relation to the content outlined in the specification; they are not designed to define that content.

The grade awarded will depend in practice upon the extent to which the candidate has met the assessment objectives (as in section 6) overall. Shortcomings in some aspects of the examination may be balanced by better performances in others.

**Grade F** When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates draw on and use various sources of information. They clarify their ideas through discussion, drawing and modelling; use their understanding of the characteristics of familiar products when developing and communicating their own ideas and work from their own plans, modifying them where appropriate.

Candidates work with a range of tools, materials, equipment, components and processes with some precision; check their work as it develops and modify their approach in the light of progress; test and evaluate their products, showing that they understand the situations in which their designs will have to function and are aware of resources as a constraint and evaluate their use of basic information sources.

**Grade C** When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates use a wide range of appropriate sources of information and strategies to develop ideas, responding to information they have identified. They investigate form, function and production processes and communicate ideas, using appropriate media.

Candidates recognise the needs of users and develop realistic designs. They produce plans that make use of time and resources to carry out the main stages of making products. They work with a range of tools, materials, equipment, components and processes, taking account of their characteristics, and organise their work so that they can carry out processes accurately and consistently, and use tools, equipment, materials and components with precision.

Candidates adapt their methods of manufacture to changing circumstances, providing a sound explanation for any change from the initial specification. They select appropriate techniques to test and evaluate how their products would perform when used and modify their products in the light of ongoing evaluation to improve their performance. They evaluate their use of information sources.

**Grade A** When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates seek out and use information to help their detailed design thinking, and recognise the needs of a variety of client groups. They are discriminating in their selection and use of information sources to support their work and they use a wide range of strategies to develop appropriate ideas, responding to information they have identified.

Candidates investigate form, function and production processes and communicate ideas using a variety of appropriate media. They recognise the different needs of a range of users when developing fully realistic designs. When planning, they make sound decisions on materials and techniques based on their understanding of the physical properties and working characteristics of materials. They work from formal plans that make the best use of time and resources; work with a range of tools, equipment, materials and components to a high degree of precision and make products that are reliable and robust and that fully meet the quality requirements given in the design proposal.

Candidates identify conflicting demands on their design, explain how their ideas address these demands and use this analysis to produce proposals. They identify a broad range of criteria for evaluating and testing their products, clearly relating their findings to the purpose for which the products were designed and the appropriate use of resources, and fully evaluate their use of information sources.

**B**

## Record Forms

Candidate Record Forms and Centre Declaration Forms are available on the AQA website in the Administration area. They can be accessed via the following link: [http://www.aqa.org.uk/admin/p\\_course.php](http://www.aqa.org.uk/admin/p_course.php)

## C

# Overlaps with other Qualifications

Some overlaps exist between this and other Design and Technology specifications. The overlap is primarily in the design process and the scheme of assessment. As all specifications conform to the GCSE Design and Technology Subject Criteria, there are also overlaps of broad content, e.g. ICT, health and safety, systems and control, industrial and commercial practice, but each is dealt with in the context of the focus areas embodied in the specification title.



D

# Project Assessment Matrix

DESIGN & TECHNOLOGY PROJECT ASSESSMENT MATRIX

DESIGNING SKILLS

	A			B			C			D			E			F			G			U																																															
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L																																													
A	90	89	88	86	85	84	82	81	80	78	77	76	74	73	72	70	69	68	66	65	64	62	61	60	58	57	56	54	53	52	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32	30	29	28	26	25	24	22	21	20	18	17	16	14	13	12	10	9	8	6	5	4	3	2	1
B	88	87	86	84	83	82	80	79	78	76	75	74	72	71	70	68	67	66	64	63	62	60	59	58	56	55	54	52	51	50	48	47	46	44	43	42	40	39	38	36	35	34	32	31	30	28	27	26	24	23	22	20	19	18	16	15	14	12	11	10	9	8	7	6	5	4	3	2	1
C	86	85	84	82	81	80	78	77	76	74	73	72	70	69	68	66	65	64	62	61	60	58	57	56	54	53	52	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32	30	29	28	26	25	24	22	21	20	18	17	16	14	13	12	10	9	8	6	5	4	3	2	1			
D	82	81	80	78	77	76	74	73	72	70	69	68	66	65	64	62	61	60	58	57	56	54	53	52	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32	30	29	28	26	25	24	22	21	20	18	17	16	14	13	12	10	9	8	6	5	4	3	2	1						
E	80	79	78	76	75	74	72	71	70	68	67	66	64	63	62	60	59	58	56	55	54	52	51	50	48	47	46	44	43	42	40	39	38	36	35	34	32	31	30	28	27	26	24	23	22	20	19	18	16	15	14	12	11	10	9	8	7	6	5	4	3	2	1						
F	78	77	76	74	73	72	70	69	68	66	65	64	62	61	60	58	57	56	54	53	52	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32	30	29	28	26	25	24	22	21	20	18	17	16	14	13	12	10	9	8	6	5	4	3	2	1									
G	74	73	72	70	69	68	66	65	64	62	61	60	58	57	56	54	53	52	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32	30	29	28	26	25	24	22	21	20	18	17	16	14	13	12	10	9	8	6	5	4	3	2	1												
U	72	71	70	68	67	66	64	63	62	60	59	58	56	55	54	52	51	50	48	47	46	44	43	42	40	39	38	36	35	34	32	31	30	28	27	26	24	23	22	20	19	18	16	15	14	12	11	10	9	8	7	6	5	4	3	2	1												
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