

Getting Started

GCE Design and Technology: Food Technology

Pearson Edexcel Level 3 Advanced Subsidiary GCE in Design and Technology: Food Technology (8FT01)
First certification 2014

Pearson Edexcel Level 3 Advanced GCE in Design and Technology: Food Technology (9FT01)
First certification 2014

Issue 2

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Introduction

The Edexcel GCE in Design and Technology: Food Technology has been developed in consultation with schools, colleges, higher education institutes, to engage students and teachers.

This document will give you an overview of the course. The guidance in this book is intended to help you plan the course and to give you further insight into the principles behind the content, to help you and your students succeed in the course.

Key points

- A four-unit structure
- Internal units weighted at 60 per cent
- Clear assessment criteria for the internal assessed units — Units 1 and 4
- Guidance on each assessment criterion in Units 1 and 4
- Focused tasks in Unit 1
- Encourages creative and innovative approach to the internal assessed units
- Clearly defined content in the external assessed units — Units 2 and 3

Unit overview

The unit overviews give a summary of the content of each unit so that you can organise your teaching effectively.

Unit 1: Portfolio of Creative Skills (Internal assessment)	
Sections:	Sub-sections:
Product investigation	Performance analysis Materials and/or components/ingredients Manufacture Quality
Product design	Design and development Communicate
Product manufacture	Production plan Making Testing

Unit 2: Design and Technology in Practice (External assessment)	
Sections:	Sub-sections:
Materials, components/ ingredients and working properties	Carbohydrates Fats Proteins Other components and additives
Industrial and commercial practice	Preparation Underlying microbiological principles Preservation processes
Quality	Good manufacturing practice

Unit 3: Food Products, Nutrition and Product Development (External assessment)	
Sections:	Sub-sections:
Food commodities, chemical composition and application of manufacturing processes	Meat and fish Dairy products Fruit and vegetables Eggs Sugar Fermented products Cereals
Nutrition	Human nutrition and diet Digestive system Nutritional recommendations and terminology Contribution of nutrients and constituents of food to the diet Contemporary issues
Product development and food innovation	Product development

Unit 4: Commercial Design (Internal assessment)	
Sections:	Sub-sections:
Product design and make	Research and analysis
	Product specification
	Design and development: Design Review Develop Communicate
	Planning
	Making: Use of equipment Quality Complexity/level of demand
	Testing and evaluating

Assessment overview

The course will be assessed by both externally set examinations and internal assessment. Detailed information on each unit can be found later in the document.

AS units

Unit 1: Portfolio of Creative Skills	Unit 2: Design and Technology in Practice
<p>Internal assessment Internally set and marked by the centre and externally moderated by Edexcel.</p> <p>Number of marks: 90 Students produce one portfolio that contains evidence of product investigation, product design and product manufacture. Photographic evidence must be supplied for the product(s) they have made.</p>	<p>External assessment Time: 1 hour 30 minute examination set and marked by Edexcel.</p> <p>Number of marks: 70 Style of paper: Question and answer booklet, consisting of short-answer and extended-writing type questions.</p>

A2 units

Unit 3: Food Products, Nutrition and Product Development	Unit 4: Commercial Design
<p>External assessment Time: 2-hour examination set and marked by Edexcel.</p> <p>Number of marks: 70 Style of paper: Question and answer booklet, consisting of short-answer and extended-writing type questions.</p>	<p>Internal assessment Internally set and marked by the centre and externally moderated by Edexcel.</p> <p>Number of marks: 90 Students design and make a product. This is evidenced in their design folder with photographic evidence of them making the product and of the final product itself.</p>

Modes of delivery

Advanced Subsidiary GCE — Year 12

Term 1		Term 2		Half-term 5
Half-term 1	Half-term 2	Half-term 3	Half-term 4	
Unit 2: Design and Technology in Practice	Unit 1: Portfolio of Creative Skills — Product investigation	Unit 1: Portfolio of Creative Skills — Product design	Unit 1: Portfolio of Creative Skills — Product manufacture	Revision and examination preparation

OR

Terms 1 and 2			Half-term 5
Unit 2: Design and Technology in Practice			
Unit 1: Portfolio of Creative Skills — Product investigation	Unit 1: Portfolio of Creative Skills — Product design	Unit 1: Portfolio of Creative Skills — Product manufacture	

OR

Terms 1 and 2		Half-term 5
Unit 2: Design and Technology in Practice		
Unit 1: Portfolio of Creative Skills — Product investigation	Unit 1: Portfolio of Creative Skills — Product manufacture	
Unit 1: Portfolio of Creative Skills — Product design		

OR

Terms 1 and 2	Half-term 5
Unit 2: Design and Technology in Practice	
Unit 1: Portfolio of Creative Skills — Product investigation	
Unit 1: Portfolio of Creative Skills — Product design	
Unit 1: Portfolio of Creative Skills — Product manufacture	

The tables above are examples of how the AS course might be delivered over a period of five half-terms. Centres are encouraged to teach students in the most effective way, taking account of their teaching styles, strengths and resources.

The illustrations above are suggestions, but a recommendation would be that whichever mode of delivery is adopted, it should include some elements of parallel delivery. This includes the theory unit, *Unit 2: Design and Technology in Practice*, so that knowledge and understanding of materials, components/ingredients, processes and techniques is always current and relevant to students' tasks.

Advanced Level GCE – Year 13

Terms 1 and 2	Half-term 5
Unit 3: Food Products, Nutrition and Product Development	Revision and examination preparation
Unit 4: Commercial Design	

Exemplar scheme of work

This outline scheme of work is based upon a five-hours-per-week timetable allocation over a period of five weeks.

WEEK 1	<p>LESSON 1: Underlying Microbial Principles An introduction to microbiology Teacher explains what microbiology is, giving an overview of the following words:</p> <ul style="list-style-type: none"> a) classification b) pathogens c) spoilage d) beneficial e) inert.
	<p>LESSON 2: Focus on three main organisms of concern in food technology: bacteria, yeasts, moulds. Areas to focus on — general:</p> <ul style="list-style-type: none"> a) morphology. <p>Areas to focus on — detail:</p> <ul style="list-style-type: none"> b) reproduction <ul style="list-style-type: none"> i) moulds — asexual/sexual ii) yeasts — budding iii) bacteria — binary fission c) types of bacteria — salmonella, E.coli etc.
	<p>LESSON 3: Student activity: Students to carry out an investigation into a bacterium using the internet. They should make their own notes and produce a short presentation.</p>
	<p>LESSON 4: Students to present their presentation on the chosen bacteria.</p>
	<p>LESSON 5: Teacher to bring together students' notes. They could produce a grid/table about bacteria. Resources: videos, DVDs, internet.</p>

WEEK 2	<p>LESSON 1: Underlying Microbial Principles Teacher led. Focus on bacteria: a) lifecycle (use diagram: bacterial growth curve). Explain the different parts of the life-cycle diagram.</p>
	<p>LESSON 2: You could then move on to the following: b) factors which influence the growth of bacteria: i) time ii) food iii) moisture iv) temperature v) oxygen vi) pH. Student activity: Students to carry out a theoretical investigation into the control of growth of micro-organisms (see Week 2, Lesson 3).</p>
	<p>LESSON 3: Student activity (continued): c) Focus on prevention: i) removal of moisture ii) altering temperature iii) exclusion of oxygen iv) altering pH v) irradiation vi) chemicals.</p>
	<p>LESSON 4: Teacher to bring together student activity on control of growth of microbes. Could produce a table, key notes on prevention. You could also have samples of food products that have been preserved using a range of methods. Class discussion on why different techniques were used on various products.</p>
	<p>LESSON 5: Underlying Microbial Principles and Preservation — Processes Note: Teacher can choose to move into preservation processes in detail (see Week 3, Lesson 4) or continue to focus on microbiology. Microbiology: a) food poisoning b) food spoilage c) food hygiene.</p>



WEEK 3

LESSON 1:**Underlying Microbial Principles and Preservation — Processes**

Microbiology (continued)

Teacher-led discussion on why the control of microbes is important.

Focus on the following:

- a) food poisoning:
 - i) chemical
 - ii) biological
 - iii) bacterial.

LESSON 2:

Teacher-led discussion on why the control of microbes is important (continued).

Focus on the following:

- b) food spoilage:
 - i) autolysis
 - ii) microbial
 - iii) enzymic
- c) food hygiene:
 - i) personal
 - ii) kitchen
 - iii) food.

LESSON 3:

Student activity: Students to carry out own research and make own notes on:

- a) food poisoning
- b) food spoilage
- c) food hygiene.

LESSON 4:**Preservation Processes**

Teacher can now move on to preservation processes.

Various strategies can be used: videos, DVDs, internet, student practical investigation.

First focus on the following for each technique:

- 1) a definition — explanation, what is it?
 - 2) how applied
 - 3) food uses
- a) Heat in reducing the numbers of micro-organisms:
 - i) pasteurisation
 - ii) sterilisation
 - iii) aseptic techniques
 - iv) canning.

LESSON 5:

b) Removal or binding of water:

- i) evaporation
- ii) drying
 - tunnel
 - spray
 - AFD
- iii) effect of salt and sugar.

WEEK 4	<p>LESSON 1: Preservation Processes c) Chemical methods: i) additives ii) preservatives.</p>
	<p>LESSON 2: Teacher could outline a number of practical investigations eg: 1) use oven to dry raw materials/make jam or chutneys 2) carry out an investigation/comparison between industry and test kitchen drying/chemical techniques.</p>
	<p>LESSON 3: d) Removal of heat in: i) chilling ii) freezing: – immersion – blast – plate – cryogenic systems.</p>
	<p>LESSON 4: Teacher could outline a number of practical investigations, eg: 1) use freezer to freeze raw materials 2) could choose a raw material that is susceptible to enzymic browning, eg apple 3) two samples: one blanched/one raw, freeze both 4) defrost and carry out an investigation/comparison between industry and test kitchen freezing techniques 5) investigate reasons for blanching.</p>
	<p>LESSON 5: This lesson allows for overflow from Lesson 4 on freezing techniques. Students could give a presentation on the investigations carried out.</p>



WEEK 5

LESSON 1:**Preservation processes**

- e) Computer control of process:
- i) process control and automation
 - ii) automated production lines.

LESSON 2:

- f) Packaging, choice of materials for individual food products and distribution:
- i) packaging materials
 - glass
 - metal
 - paper/cardboard
 - plastic
 - cellulose films.

Students to list advantages/disadvantages of various materials.

LESSON 3:

- f) Packaging, choice of materials for individual food products and distribution (continued):
- ii) storage and distribution systems
 - controlled atmosphere
 - refrigerated.

LESSON 4:

Teacher could outline a number of practical investigations, eg:

- 1) students to investigate a range of packaging materials, list advantages and disadvantages
- 2) students to investigate a range of food products and suggest suitable packaging materials or list reasons for materials which are used
- 3) students to outline the impact that packaging has on the environment and investigate ways in which packaging could be reduced.

LESSON 5:

End of unit(s) test.

Teacher could produce an examination(s) on work covered:

- micro-biology
- preservation.

Teacher to provide feedback on test results/discussion.

Integrating Unit 2 content through the delivery of Unit 1

Example: Product investigation of a chocolate cake in a box.

Assessment criteria	High level of response	Appropriate Unit 2 content
A. Performance analysis	Fully justify key technical specification points that relate to form, function, user requirements, performance requirements, materials and/or components/ingredients requirements, scale of production and costs. Compare and contrast one other existing similar product using the technical specification.	<p>Materials, components/ingredients and working properties</p> <ol style="list-style-type: none"> Carbohydrates — fundamental working properties: <ul style="list-style-type: none"> browning reactions — Maillard reactions gelatinisation (baking). Fats — the chemical nature and basic characteristics of: <ul style="list-style-type: none"> monoglycerides diglycerides. Fats — fundamental working properties: <ul style="list-style-type: none"> monoglycerides/diglycerides used as emulsifying agents rancidity — oxidative. Proteins — fundamental working properties: <ul style="list-style-type: none"> involvement in browning reactions coagulation — by heat (baking). Other components and additives – sensory characteristics: <ul style="list-style-type: none"> colours flavours. Other components and additives — physical characteristics: <ul style="list-style-type: none"> emulsifying agents and their function/emulsifiers in retarding staling in bakery goods stabilisers/stabilising agents. Other components and additives — storage characteristics: <ul style="list-style-type: none"> preservatives anti-oxidants. Other components and additives — additives used as aids to processing: <ul style="list-style-type: none"> anti-caking agents. <p>Industrial and commercial practice</p> <ol style="list-style-type: none"> Preparation — mixing: <ul style="list-style-type: none"> methods for solids. Preservation processes — chemical methods: <ul style="list-style-type: none"> preservatives. Preservation processes — computer control of process <ul style="list-style-type: none"> automated production lines. <p>Quality</p> <p>Good manufacturing practice. The principles and application of good manufacturing practice:</p> <ul style="list-style-type: none"> product specifications.



Assessment criteria	High level of response	Appropriate Unit 2 content
B. Materials and components	Suggest, with reference to quality and performance, alternative materials and/or components/ingredients that could have been used in the product. Evaluate, using advantages and disadvantages, the selection of the materials and/or components/ingredients used. Describe the impact on the environment of using the materials and/or components/ingredients identified.	Materials, components/ingredients and working properties <ol style="list-style-type: none"> 1. Carbohydrates — fundamental working properties: <ul style="list-style-type: none"> • browning reactions — Maillard reaction • gelatinisation (baking). 2. Fats — the chemical nature and basic characteristics of: <ul style="list-style-type: none"> • monoglycerides • diglycerides. 3. Fats — fundamental working properties: <ul style="list-style-type: none"> • monoglycerides/diglycerides used as emulsifying agents • rancidity — oxidative. 4. Proteins — fundamental working properties: <ul style="list-style-type: none"> • involvement in browning reactions • coagulation — by heat (baking). 5. Other components and additives — sensory characteristics: <ul style="list-style-type: none"> • colours • flavours. 6. Other components and additives — physical characteristics: <ul style="list-style-type: none"> • emulsifying agents and their function/emulsifiers in retarding staling in bakery goods • stabilisers/stabilising agents. 7. Other components and additives — storage characteristics: <ul style="list-style-type: none"> • preservatives • anti-oxidants. 8. Other components and additives — additives used as aids to processing: <ul style="list-style-type: none"> • anti-caking agents.

Assessment criteria	High level of response	Appropriate Unit 2 content
C. Manufacture	Evaluate, using advantages and disadvantages, the selection of the manufacturing processes used in the product. Suggest one alternative method of production that could have been used in the manufacture of the product. Describe the impact on the environment of using the processes identified in the production of the product.	Industrial and commercial practice <ol style="list-style-type: none"> Preparation — mixing: <ul style="list-style-type: none"> methods for solids methods for liquids. Underlying microbiological principles — the nature and application of microbiology in food preservation: <ul style="list-style-type: none"> food poisoning food hygiene. Underlying microbiological principles — the following factors that influence the growth of micro-organisms and their application to food preservation: <ul style="list-style-type: none"> nutrients pH temperature oxygen. Preservation processes — nature, processes and application of chemical methods: <ul style="list-style-type: none"> preservatives. Preservation processes — nature, processes and application of computer control of process Preservation processes — nature, processes and application of packaging, choice of materials: <ul style="list-style-type: none"> paper cardboard plastic.
D. Quality	Describe a range of quality control checks used during the manufacture of the product and explain how the main relevant standards influenced the manufacture of the product. Describe a quality assurance (QA) system for the product.	Quality Good manufacturing practice. The principles and application of good manufacturing practice: <ul style="list-style-type: none"> quality control quality assurance product specifications HACCP.

External assessed units — Units 2 and 3

Mapping sample assessment materials (SAMs) to unit content

The following section shows how each question in the SAMs for these units were mapped against the specification unit content.

Unit 2: Design and Technology in Practice

Question 1	Clarification	Content
(a)	This question is testing the candidate's knowledge of simple sugars, in particular monosaccharides. Candidates are required to name two monosaccharides.	Materials, components/ingredients and working properties — Carbohydrates part a)
(b)	This question requires the candidate to show an understanding of the term 'reducing sugars'; what reducing sugars are; and why are they so named? What components are involved? What have reducing sugars the ability to do?	Materials, components/ingredients and working properties — Carbohydrates part a)
(c)	This question requires an application and understanding of the 'Maillard reaction'. Candidates need to show what is occurring during this reaction, and which food components are involved.	Materials, components/ingredients and working properties — Carbohydrates part b)
Question 2	Clarification	Content
(a)	This question requires the candidate to recall two mixing methods that could be applied when mixing powdered materials.	Industrial and commercial practice — Preparation
(b)	An easy question requiring simple recall of any two size reduction methods from a large number of reduction methods available.	Industrial and commercial practice — Preparation
(c)	Candidates are asked to explain the difference between sorting and grading. This examines candidates' understanding of preliminary preparation processes. Candidates tend to have a better understanding of sorting. There is a clear distinction between them.	Industrial and commercial practice — Preparation
Question 3	Clarification	Content
(a)	Questions are starting to get more demanding as candidates are required to apply their knowledge and understanding of fats from a scientific angle. This question requires candidates to explain the chemical nature of simple fats as mixed triglycerides.	Materials, components/ingredients and working properties — Fats part a)
(b)	This question requires candidates to show an understanding of the basic characteristics/components of a monoglyceride, and how are they formed? An annotated diagram is acceptable.	Materials, components/ingredients and working properties — Fats part a)
(c)	This question requires candidates to apply their knowledge and understanding of how monoglycerides act as an emulsifying agent. An understanding of emulsification is essential, why do certain materials act as emulsifiers. What components do they possess in order to be emulsifiers?	Materials, components/ingredients and working properties — Fats part c)

Question 4	Clarification	Content
(a)	Candidates are required to describe any two stages of the 'four stage bacterial life cycle'. Candidates need to know these stages as the names are not given. It is an explain question so two points are required for each stage.	Industrial and commercial practice — Underlying microbiological principles part a)
(b)	This question requires candidates to apply their knowledge and understanding of bacterial food poisoning. It requires the candidates to show an understanding of the factors ; and the food/kitchen/personal hygiene issues, which must be considered in relation to food poisoning occurring. Candidates must be clear in their discussion; which factors, food, kitchen and personal issues they are discussing and must include answers from each area.	Industrial and commercial practice — Underlying microbiological principles part a)
Question 5	Clarification	Content
	Demanding question requiring the candidate to show an understanding of Good Manufacturing Practice, in particular the concept of GMP and product specifications. What is GMP all about? What does it ensure? What areas/issues is it concerned with? Product specifications cover a range of areas/points which must be indicated/carried out, in order to ensure a high quality/safe product. The second part of the question requires candidates to apply their knowledge and understanding of GMP 'that every aspect of food manufacture is fully specified in advance' by making reference to any three aspects (areas/points) which would be specified in a product specification. This question requires discussion not just single words. All areas discussed must be fully justified.	Quality — Good manufacturing practice
Question 6	Clarification	Content
(a)	This question requires candidates to explain why carbohydrates are good stabilising agents. What qualities do they possess? How do they stabilise? An explain question, so two points need to be considered. Candidates are not required to name the carbohydrates and no marks are available for naming them.	Materials, components/ ingredients and working properties — Other components and additives part b) (iii)
(b)	Candidates are required to show an understanding of the term 'retrogradation'. What is happening? Clear definition between retrogradation and syneresis.	Materials, components/ ingredients and working properties — Carbohydrates part b)
(c)	Candidates are required to apply their knowledge and understanding of gelatinisation, in particular to starch suspensions. What is happening to the starch during gelatinisation, and when the suspension cools? Describe the reactions. They should pay particular attention to correct use of temperature and reaction of starch eg 60°C starch cells swell rapidly at 80°C starch cell bursts and liquid becomes viscous.	Materials, components/ ingredients and working properties — Carbohydrates part b)



Question 7	Clarification	Content
(a)	This question requires an application of knowledge and understanding of ensuring sterility in the canning process — not what the canning process is but how it ensures sterility of contents. Basically what considerations are necessary when canning a product — how can a food manufacturer ensure that their canned products are sterile? Candidates need to consider not only temperature, time and cold point but food contents and bacterial tests.	Industrial and commercial practice — Preservation processes
(b)	This question requires candidates to consider two things — heat processes: pasteurisation and sterilisation; and their effects on milk. Candidates need to explain how both processes differ. It is important to emphasise the severity of sterilisation and in particular the correct temperature, holding time and effects on bacteria of both processes. For the effects candidates need to focus on changes to flavour and nutrition and shelf life of product.	Industrial and commercial practice — Preservation processes

NB: Please note that questions cover the three sections of this unit. No paper will ever focus entirely on one section. It is also anticipated that consecutive years will address different parts of the unit content to give full unit coverage. Therefore, it is important that candidates are familiar with the content for the whole unit and are given plenty of opportunities to answer examination style questions throughout the course to prepare them for the final examination.

Unit 3: Food Products, Nutrition and Product Development

Question 1	Clarification	Content
(a)	An easy, straightforward question. Candidates are required to simply recall their knowledge of proteins in milk by naming the two proteins. They are not required to further name the whey proteins or give any explanation.	Food commodities, chemical composition and application of manufacturing processes — Dairy products part a)
(b)	This question requires the candidates to show an understanding of why homogenisation of milk is necessary. What is the process doing to the fat globules in the milk and why is it done?	Food commodities, chemical composition and application of manufacturing processes — Dairy products part b)
(c)	This question requires candidates to apply their knowledge and understanding of cheese manufacturing. A summary is required for each stage; the examiner is simply looking for four logical main stages in the process.	Food commodities, chemical composition and application of manufacturing processes — Dairy products part c)
Question 2	Clarification	Content
(a)	This question requires candidates to show an understanding of the encapsulation process. What it is and why/how it is used.	Product development and food innovation — Product development part d)
(b)	This question simply requires candidates to outline four possible benefits of genetic modification. This is from the manufacturers/ producers' point of view, and not the consumer or developing world perspective. The candidate is required to show how GM could be of benefit. Concern/opinions or other issues are not required.	Product development and food innovation — Product development part d)
Question 3	Clarification	Content
(a)	This question requires candidates to show an understanding of the word climacteric in relation to fruit ripening. It is simply a comparison between how climacteric and non-climacteric fruit ripens. What are the differences? A detailed explanation referring to each type of fruit is required in order to get the full marks.	Food commodities, chemical composition and application of manufacturing processes — Fruit and vegetables part a)
(b)	This question requires candidates to show a knowledge and understanding of the ripening of fruit during storage. What factors influence ripening – what factors could lead to rapid ripening if not controlled? It is not enough to simply stage the factors but explain its influence.	Food commodities, chemical composition and application of manufacturing processes — Fruit and vegetables part a)
Question 4	Clarification	Content
(a) and (b)	This question is demanding as candidates are required to know in detail, the functions and deficiency of two named minerals: iron and calcium.	Nutrition — Contribution of nutrients and constituents of food to the diet

Question 5	Clarification	Content
(a) (i) and (ii)	This question requires candidates to discuss the structure of both meat and fish. Answers must be specific regarding structure and clear use of terminology is required to score marks.	Food commodities, chemical composition and application of manufacturing processes — Meat and fish parts a) and b)
(b)	This question requires candidates to do two things: compare (look for similarities) and contrast (look for differences) the nutritional composition of both meat and fish. Candidates need to be clear in the construction of their responses in order to gain the full marks. Responses need to include both meat and fish for full marks to be awarded.	Food commodities, chemical composition and application of manufacturing processes — Meat and fish parts a) and b)
Question 6	Clarification	Content
	This question requires candidates to evaluate two packed lunches. On first appearance packed lunch 1 is the more unhealthy lunch but packed lunch 2 also has concerns. Candidates need to explain the nutritional implications of both packed lunches to the diet. Both packed lunches have their advantages and disadvantages and candidates need to be clear about these differences in their evaluation.	Nutrition — Contemporary issues
Question 7	Clarification	Content
	This question requires candidates to discuss fully two changes in the technological development of food materials and how these developments have influenced new food product ideas. Candidates need to be careful — it is the food materials which are the key words here not machinery, issues, packaging or equipment. This question requires a concise but coherent, fully detailed response, outlining exactly what the changes are, describing them and relating them to a product. Also justification of the use of the new food material would also be expected.	Product development and food innovation — Product development part c)

NB: Please note that questions cover the three sections of this unit. No paper will ever focus entirely on one section. It is also anticipated that consecutive years will address different parts of the unit content to give full unit coverage. Therefore, it is important that students are familiar with the content for the whole unit and are given plenty of opportunities to answer examination style questions throughout the course to prepare them for the final examination.

Internal assessed units — Units 1 and 4

Guidance in applying the assessment scheme

The following points may help when establishing a final mark for the student's work:

- read through the student's work to form an overall impression of the level of response achieved
- study the evidence presented by the student for each assessment criterion
- read the level of response descriptors for each assessment criterion and identify the group of statements that offer the 'best fit' for a student's work
- match the evidence presented and the individual statements available to further refine the range of marks, eg 7–12, to establish a final score within that range.

Where 'best fit' bridges two levels of response, eg medium and high, and where perhaps two level statements from the high level are met and the rest firmly within the medium level, it would be acceptable to place the overall level of response within the bottom one or two marks of the high level of response category. More statements met from the high level category would earn further credit in that section.

Similarly, if the majority of statements in the medium level of response category were met, but one or two were in the low level of response category, the likely overall mark would be at the low end of the medium level category. More statements judged to be in the low level of response category would lower the overall mark accordingly.

This type of refinement is more likely to be necessary where a substantial range of marks is available at each level of response. The maximum mark range in any group of level descriptors is six.

In Unit 1 — Product manufacture, where students have produced more than one piece of work and each piece focuses on particular skills using specific materials, assessment should be carried out as an holistic exercise, taking into account the range of work produced and the levels of response achieved overall.

Assessment of 'best fit' should be established, but the highest levels of achievement in each assessment category are likely to be derived from different making exercises. Where this is the case, the evidence used to award marks must be clearly photographed and submitted for external moderation.

Breakdown of each assessment criterion

Each assessment criterion has a range of marks. The following tables show how those marks are broken down.

When marking students work this will help you to determine the final mark to award them for each criterion.

This should be used in conjunction with the information on *Guidance in applying the assessment scheme*.

Unit 1: Portfolio of Creative Skills

Product investigation

Assessment criteria: A. Performance analysis

Level of response	Mark range
Fully justify key technical specification points <ul style="list-style-type: none"> • that relate to form, function, user requirements, performance requirements, materials and/or components/ ingredients requirements, scale of production and costs Compare and contrast one other existing similar product using the technical specification.	4-6
Identify <ul style="list-style-type: none"> • with some justification • a range of realistic and relevant specification points that include reference to form, function and user requirements. 	1-3

Assessment criteria: B. Materials and/or components/ingredients

Level of response	Mark range
Suggest, with reference to quality and performance, alternative materials and/or components/ingredients that could have been used in the product. Evaluate, using advantages and disadvantages, the selection of the materials and/or components/ingredients used. Describe the impact on the environment of using the materials and/or components/ingredients identified.	7-9
Describe a range of useful properties that relate to the materials and/or components/ingredients identified and <ul style="list-style-type: none"> • justify their selection and use in the product. Identify alternative materials and/or components/ingredients that could have been used in the product.	4-6
Identify a material or component/ingredient used in the product. Describe a useful property of that material or component/ingredient <ul style="list-style-type: none"> • and justify its use. 	1-3

Assessment criteria: C. Manufacture

Level of response	Mark range
Evaluate, using advantages and disadvantages, the selection of the manufacturing processes used in the product. Suggest one alternative method of production that could have been used in the manufacture of the product. Describe the impact on the environment of using the processes identified in the production of the product.	7-9
Describe <ul style="list-style-type: none"> • a range of processes used in the manufacture of the product • and fully justify their use for the level of production of the product. 	4-6
Identify, <ul style="list-style-type: none"> • describe • and justify the use of a manufacturing process used in the construction of the product. 	1-3

Assessment criteria: D. Quality

Level of response	Mark range
Describe a range of quality control checks used during the manufacture of the product <ul style="list-style-type: none"> • and explain how the main relevant standards influenced the manufacture of the product. Describe a quality assurance (QA) system for the product.	4-6
Identify, <ul style="list-style-type: none"> • describe • and justify the use of one quality control check during the manufacture of the product. 	1-3

Product design

Assessment criteria: E. Design and development

Level of response	Mark range
<p>Present alternative ideas that are workable, realistic and detailed and which fully address the design criteria. Ideas demonstrate detailed understanding of materials and/or components/ingredients, processes and techniques.</p> <p>Produce a final design proposal that is significantly different and improved compared to any previous alternative design ideas.</p> <p>The design proposal includes technical details of materials and/or components/ingredients, processes and techniques.</p> <p>Making is used to test important aspects of the final design proposal.</p> <p>The final design proposal is evaluated objectively against the design criteria in order to fully justify the design decisions taken.</p>	13-18
<p>Present realistic alternative design ideas.</p> <p>Ideas are detailed and address most design criteria.</p> <p>Developments are appropriate and use details from ideas to change, refine and improve the final design proposal.</p> <p>A final detailed design proposal is presented.</p> <p>Making is used to test some aspects of the final proposal against relevant design criteria.</p> <p>Evaluative comments objectively consider some aspects of the design brief(s)/need(s).</p>	7-12
<p>Present simplistic alternative design ideas.</p> <p>Ideas are superficial and address limited design criteria.</p> <p>Developments are minor and cosmetic.</p> <p>A basic final design proposal is presented.</p> <p>Simple making technique is used to test an aspect of the design proposal.</p> <p>Evaluative comments are subjective and superficial.</p>	1-6

Assessment criteria: F. Communicate

Level of response	Mark range
<p>Use a range of communication techniques and media including ICT,</p> <ul style="list-style-type: none"> • with precision and accuracy • to convey enough detailed and comprehensive information to enable third-party manufacture of the final design proposal. <p>Annotation provides explanation and most technical details of materials and/or components/ingredients and processes with justification.</p>	9-12
<p>Use a range of communication techniques, including ICT,</p> <ul style="list-style-type: none"> • that are carried out with sufficient skill • to convey an understanding of design and develop intentions and construction details of the final design proposal. <p>Annotation provides explanation and most technical details of materials and/or components/ingredients and process selection.</p>	5-8
<p>Use a limited range of communication techniques</p> <ul style="list-style-type: none"> • carried out with enough skill • to convey some understanding of design and develop intentions. <p>Annotation provides limited technical details of materials and/or components/ingredients and processes.</p>	1-4

Product manufacture

Assessment criteria: G. Production plan

Level of response	Mark range
Produce a detailed production plan <ul style="list-style-type: none"> • that considers stages of production in the correct sequence, • realistic timescales and deadlines for the scale of production. 	4-6
Produce a limited production plan <ul style="list-style-type: none"> • that considers the main stages of manufacture, • reference to time and scale of production. 	1-3

Assessment criteria: H. Making

Level of response	Mark range
Demonstrate a detailed understanding and justified selection of a range of appropriate <ul style="list-style-type: none"> • materials and/or components/ingredients • and processes. Demonstrate demanding and high quality making skills and techniques. Show accuracy and precision when working with a variety of materials and/or components/ingredients, processes and techniques. High-level safety awareness is evident throughout all aspects of manufacture.	13-18
Demonstrate a good understanding and selection of an appropriate range of <ul style="list-style-type: none"> • materials and/or components/ingredients • and processes. Demonstrate competent making skills and techniques appropriate to a variety of materials and/or components/ingredients and processes. Show attention to detail and some precision. Demonstrate an awareness of safe working practices for most specific skills and processes.	7-12
Demonstrate a limited understanding and selection of a narrow range of <ul style="list-style-type: none"> • materials and/or components/ingredients • and processes. Use limited making skills and techniques. Demonstrate little attention to detail. Demonstrate an awareness of specific safe working practices during product manufacture.	1-6

Assessment criteria: I. Testing

Level of response	Mark range
Describe and justify a range of tests carried out to check the performance or quality of the product(s). Relevant, measurable points of the design brief(s)/need(s) are objectively referenced. Third-party testing is used.	4-6
Carry out one or more simple tests to check the performance or quality of the final product(s). Some points of the design brief(s)/need(s) are referenced superficially. Test results are recorded and are subjective.	1-3

TOTAL NUMBER OF MARKS AVAILABLE	90
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Unit 4: Commercial Design — Assessment criteria

A. Research and analysis

Level of response	Mark range
Analysis is detailed with most design needs clarified. Research is selective and focuses on the needs identified in the analysis.	3-4
Analysis is limited with some design needs clarified. Research is superficial and does not focus on the needs identified in the analysis.	1-2

B. Product specification

Level of response	Mark range
Specification points are realistic, technical and measurable. Specification fully justifies points developed from research in consultation with a client/user-group. Sustainability of resources is realistically considered and relevant when developing specification points.	4-6
Specification points are realistic but not measurable. Some specification points are developed from research in limited consultation with a client/user-group, but are not justified. Sustainability of resources is considered superficially when developing specification points.	1-3

C. Design and development — Design

Level of response	Mark range
Present alternative design ideas that are realistic, workable and detailed. Ideas demonstrate detailed understanding of materials and/or components/ingredients, processes and techniques supported by research information. Ideas address all specification points. Client/user-group feedback shown.	7-10
Present alternative design ideas that are realistic and workable. Ideas are detailed and use relevant research. Ideas address most specification points.	4-6
Present alternative design ideas that are similar and simplistic. Ideas are similar and use limited research. Limited specification points are addressed.	1-3

C. Design and development — Review

Level of response	Mark range
Present objective evaluative comments against most specification points that consider client/user-group feedback. Evaluative comments include realistic issues of sustainability relating to design and resources.	3-4
Present general and subjective comments against some specification points. An aspect of sustainability is evaluated superficially.	1-2

C. Design and development — Develop

Level of response	Mark range
<p>Development is used to produce a final design proposal that is significantly different and improved compared to any previous alternative design ideas.</p> <p>The final design proposal includes technical details of materials and/or components/ingredients, processes and techniques.</p> <p>Making is used to test important aspects of the final design proposal against relevant design criteria.</p> <p>Client/user-group feedback is used for final modifications.</p>	7-10
<p>Developments are appropriate and use details from alternative design ideas to change, refine and improve the final design proposal.</p> <p>A final design proposal is presented that includes some details of materials and/or components/ingredients, processes and techniques.</p> <p>Making is used to test some aspects of the final design proposal against relevant design criteria.</p>	4-6
<p>Developments from alternative design ideas are minor and cosmetic.</p> <p>A final design proposal is presented that includes superficial details of materials and/or components/ingredients, processes and techniques.</p> <p>Simple making technique is used to test an aspect of the final design proposal against a design criterion.</p>	1-3

C. Design and development — Communicate

Level of response	Mark range
<p>Use a range of communication techniques and media, including ICT,</p> <ul style="list-style-type: none"> • that are carried out with precision and accuracy • to convey enough detailed and comprehensive information to enable a third party to manufacture the final design proposal. 	4-6
<p>Use a range of communication techniques, including ICT,</p> <ul style="list-style-type: none"> • that are carried out with sufficient skill • to convey an understanding of design and develop intentions and construction details of the final design proposal. 	1-3

D. Planning

Level of response	Mark range
<p>Produce a detailed production plan that considers the main stages of manufacture in the correct sequence appropriate to the scale of production.</p> <p>Realistic and achievable time scales and deadlines are evidenced for the scale of production.</p> <p>Quality and safety checks are shown and justified.</p>	4-6
<p>Produce a production plan that considers the main stages of manufacture.</p> <p>Reference to time and scale of production is shown.</p> <p>Quality and safety are evidenced superficially.</p>	1-3



E. Making — Use of equipment

Level of response	Mark range
Select equipment for specific uses independently. Use with precision and accuracy. High level of safety awareness, for self and others, when using specific equipment.	7-9
Select appropriate equipment with some guidance. Use with some skill and attention to detail. Show sufficient levels of safety awareness, for self and others, when using specific equipment.	4-6
Select general equipment with guidance. Use with limited skill and attention to detail. Show a limited level of safety awareness, for self and others, when using specific equipment.	1-3

E. Making — Quality

Level of response	Mark range
Display a detailed understanding of the working properties of materials and/or components/ingredients used • with justification for their selection. Display a justified understanding of the use of manufacturing processes. Produce a high quality final product • that matches all aspects of the final design proposal • and functions fully.	11-16
Display a good understanding of the working properties of materials and/or components/ingredients used • with relevant reasons for their selection. Display a good understanding of the use of relevant manufacturing processes. Produce a final product that matches the final design proposal • and functions adequately.	6-10
Display a limited understanding of the working properties of materials and/or components/ingredients used • with limited reasoning for their selection. Display a limited understanding of the use of manufacturing processes. Produce a final product that barely matches the final design proposal • and functions poorly.	1-5

E. Making — Complexity/ level of demand

Level of response	Mark range
The complexity of task is challenging. A wide range of skills is required, • demonstrating precision and accuracy in their use.	7-9
The complexity of task offers some challenge. A range of skills is required • demonstrating attention to detail in their use.	4-6
The complexity of task is undemanding. A limited range of skills is needed that • require little attention to detail in their use.	1-3

F. Testing and evaluating

Level of response	Mark range
<p>A range of tests justified and carried out to check the performance and/or quality of the final product. Objective evaluative comments, including third-party evaluation, consider most relevant, measurable specification points in detail.</p> <p>Suggestions for modifications that are justified from tests carried out focus on improving performance and/or quality of the final product.</p> <p>Relevant and useful life cycle assessment carried out on the final product to check its sustainability.</p>	7-10
<p>A range of tests carried out to check the performance and/or quality of the final product. Evaluative comments are objective and reference most specification points.</p> <p>Suggestions for modifications are relevant and are justified from tests that were carried out.</p>	4-6
<p>One or more simple tests carried out to check the performance and/or quality of the final product. Evaluative comments are subjective and reference a few specification points superficially.</p> <p>Suggestions for modifications are cosmetic.</p>	1-3

TOTAL NUMBER OF MARKS AVAILABLE	90
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Unit 1: Portfolio of Creative Skills — Building a portfolio

Student portfolios should contain a variety of evidence covering a wide range of skills and demonstrating an in-depth knowledge and understanding of the subject. The portfolio can comprise of several separate investigating, designing and making tasks, or a few combined design and make tasks. The resulting three parts of a student's portfolio should be assessed holistically.

For example: Separate investigating, designing and making tasks

Product investigation	Product design	Product manufacture
Product investigation 1: Analyse of a food/drink product and packaging eg dessert and packaging.	Design task 1: Design a dessert suitable for a 'Free-From' range of desserts by modelling nutrient/ingredient content of standard and free-from dessert using ICT.	Making task 1: Produce a standard and free-from dessert. Carry out a comparative/sensory analysis between standard and free-from desserts.
Product investigation 2: Disassembly of a food product eg ready-meal (lasagne).	Design task 2: Design using ICT, a layered food product. Can be sweet or savoury.	Making task 2: Produce layered product showing at least two high-level making skills eg pastry, cake/sauce making; gelling, setting/aeration/ laminating skills etc.
	Design task 3: Designing a food product with packaging. Design packaging on computer; model nutritional content; Investigate functionality of ingredients.	Making task 3: Produce a range of products, showing a wide range of high level skills. Carry out comparative/sensory analysis of products.

For example: Combined design and make tasks

Product investigation	Product design	Product manufacture
Product investigation 1: Research and analysis of a food/drink product and packaging.	Design task 1: Designing an improved food/ drink product. Could include only one change, eg substitute one ingredient to make product free-from/low in calories/high in fibre, etc.	Making task 1: Produce an improved food/drink product. Showing at least one high-level skill.
Product investigation 2: Research and analysis of a ready-made product.	Design task 2: Designing a layered product. Investigate functionality of ingredients.	Making task 2: Produce a layered product using a range of high-level making skills. Could also carry out investigative work into the functionality of ingredients.

Unit 1: Portfolio of Creative Skills — Exemplar student work

Product Design — Design and development criteria (18 marks)

There are a number of possible starting points for this section. The design brief(s)/needs(s) may be given to students by the teacher or they may define their own.

The following are two possible types of brief students may want to use:

- a focused design brief for a specific need/want
- a 'blue sky' project resulting in concepts using future technology.

A detailed design specification is not required. However, design brief(s)/needs(s) must contain a range of design criteria that students' final design proposals must meet.

In the following example the design brief was given to students by the teacher. This individual brief was part of a series of briefs focusing upon a wide range of design skills involving different scenarios and different materials.

Design brief/need

Design a new and exciting cook-chill meal which would appeal to a vegetarian teenager.

Design criteria:

- *it must be savoury*
- *serve one person*
- *have a herby flavour*
- *be reheatable in a microwave*
- *be filling as it is a main meal*
- *appeal to vegetarian teenagers.*

Some of the six design criteria points listed are not sufficiently measurable to enable the student to later evaluate the proposals against the design criteria. It would be better, for example, to give a suggested approximate serving size (grams) and also to establish the minimum amount of filling ingredient (presumably carbohydrate) that would be required per portion.

There should be identification and justification of the appropriate taste testers who will be used, to ensure the validity of the objective evaluations.

What students need to evidence

Students should consider the design problem and produce a range of alternative design ideas that focus on the whole or parts of the problem.

Students do not need to produce a wide range of alternative ideas. It is better to produce more focused work of a higher quality than a lot of work of a lesser quality.

Students should explore different design approaches in their work, applying their knowledge of materials, components/ingredients, processes and techniques to produce realistic design proposals that satisfy the design brief(s)/need(s).

Students should evaluate each of their ideas objectively against the criteria set out in their design brief(s)/need(s) to ensure that their designs are realistic and viable.

The use of detailed annotation is an important feature of design development and students should use it to explain details of their design thinking and to offer thoughts on their design proposals.

Example of a medium-level response

The following sheets outline a medium level of response to a teacher-set design brief. The moderator clearly makes suggestions for further improvement of the student's work.

Sheet 1: Initial ideas (1)

Idea	Relative merits	Specification points met	Manufacturing	Development potential
Vegetarian chilli	<p>+ve points vary portion size good aroma, spicy good flavour, spicy vary types of beans</p> <p>-ve points not really 'new' or 'exciting'</p>	<ul style="list-style-type: none"> ✓ Savoury ✓ Serve 1 person ✓ Reheat in microwave ✓ Filling as it is a main meal ✓ Have a herby taste ✓ Appeal to a vegetarian teenager 	Rice must be cooled immediately to prevent cereus spores forming. Use by date needs to be carefully considered to minimise food poisoning. Also reheating times need to be clear to ensure thorough reheating of rice without over cooking it. Easily modified for a vegetarian.	<ul style="list-style-type: none"> * variety of protein foods — soya, Quorn™, tofu * variety of beans * strength of chilli * addition of other herbs or spices * carbohydrate food — rice, pasta, noodles
Vegetarian moussaka	<p>+ve points range of less familiar flavours — 'new' strong herby flavour and aroma</p> <p>-ve points texture may go mushy if overcooked or reheated for too long</p>	<ul style="list-style-type: none"> ✓ Savoury ✓ Serve 1 person ✓ Reheat in microwave ✓ Filling as it is a main meal ✓ Have a herby taste ✓ Appeal to a vegetarian teenager 	Ingredients could be seasonal. Soya or tofu or Quorn™ are readily available. Easily modified for a vegetarian.	<ul style="list-style-type: none"> * variety of protein foods — soya, Quorn™, tofu * vary layers of aubergine with potato * tomatoes — tinned, fresh? * topping to add texture * cheese for colour, flavour
Pasta bake	<p>+ve points familiar food enjoyed by teenagers, can easily be vegetarian</p> <p>-ve points can be dry can be bland not new or exciting</p>	<ul style="list-style-type: none"> ✓ Savoury ✓ Serve 1 person ✓ Reheat in microwave ✓ Filling as it is a main meal ✓ Have a herby taste ✓ Appeal to a vegetarian teenager 	Ingredients are readily available throughout the year. Vegetarian recipe initially. Could use local produce — a popular growing gap in the market.	<ul style="list-style-type: none"> * shapes of pasta * colour of pasta * flavour of sauce * type of sauce * topping for colour, texture * herb variation

Sheet 2: Initial ideas (2)

Idea	Relative merits	Specification points met	Manufacturing	Development potential
Quorn™ bolognese	<p>+ve points good appearance Quorn™ easily takes on herb flavours filling vary portion size</p> <p>-ve points Quorn™ texture not liked</p>	<ul style="list-style-type: none"> ✓ Savoury ✓ Serve 1 person ✓ Reheat in microwave ✓ Filling as it is a main meal ✓ Have a herby taste ✓ Appeal to a vegetarian teenager 	Easily modified for a vegetarian. Ingredients readily available. Easy to produce in batches.	<ul style="list-style-type: none"> * type of protein — soya, Quorn™, tofu * pasta colour * herb variation * tomatoes — tinned, fresh
Pepper stir fry	<p>+ve points good range of textures appetising aroma</p> <p>-ve points doesn't reheat successfully not filling for a main meal</p>	<ul style="list-style-type: none"> ✓ Savoury ✓ Serve 1 person X Reheat in microwave X Filling as it is a main meal ✓ Have a herby taste ✓ Appeal to a vegetarian teenager 	Use local ingredients. Vegetarian recipe to start with. Could add Quorn™/tofu/soya pieces for extra protein and texture. All ingredients available throughout the year.	<ul style="list-style-type: none"> * vary vegetables * carbohydrate — noodles or pasta * herbs variation * sauce variation * addition of alternative protein
Spicy potato cakes	<p>+ve points vary range of flavours good aroma, spicy</p> <p>-ve points not good at reheating</p>	<ul style="list-style-type: none"> ✓ Savoury ✓ Serve 1 person X Reheat in microwave ✓ Filling as it is a main meal ✓ Have a herby taste ✓ Appeal to a vegetarian teenager 	Use cutter for shape and depth. Ingredients available throughout the year. Easily made in batches and sold in pairs.	<ul style="list-style-type: none"> * vary shape * vary herbs/spices * coating variations * cooking methods * sauce to accompany * size, depth



Moderator comments: Sheets 1 and 2

A good range of ideas is presented. They each fit the brief and are workable and realistic. The method of presentation of results is succinct, but the detail does not merit more than the medium level of response.

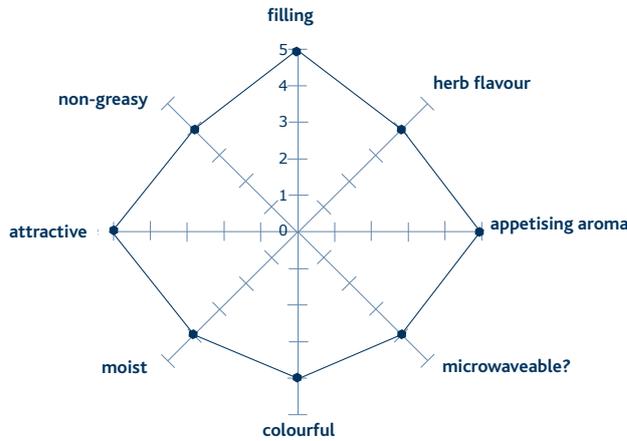
The layout would lead the reader to believe that many of the evaluative comments were arrived at prior to, or independent of, objective evaluation by the appropriate tester.

The 'relative merits' comments address only some of the design criteria. There is no indication of the basis upon which these decisions were made and are made without justification. The student needs to provide much more detail of the testing conducted, before the tick box could be completed in order to reach at the higher assessment level.

The 'manufacturing' section is of limited value in this section of the coursework.

Sheet 3: Attribute profiles (1)

VEGETABLE MOUSSAKA



Evaluation

The moussaka scored well against **all** the initial specification points except non-greasy. This was possibly due to the cheese.

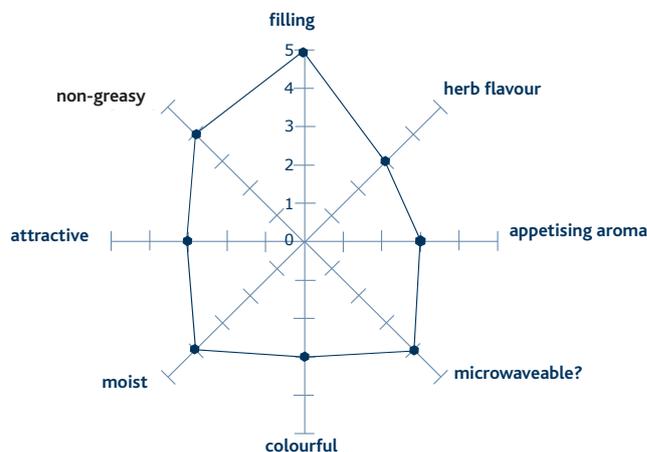
Comments by potential customers

'Well presented and filling. I would definitely say this could be served as a main meal.'

'Really appetising to look at; a lovely basil aroma that goes well with the aubergines and cheese.'

'Reheated better than I expected. Very acceptable'

VEGETARIAN CHILLI



Evaluation

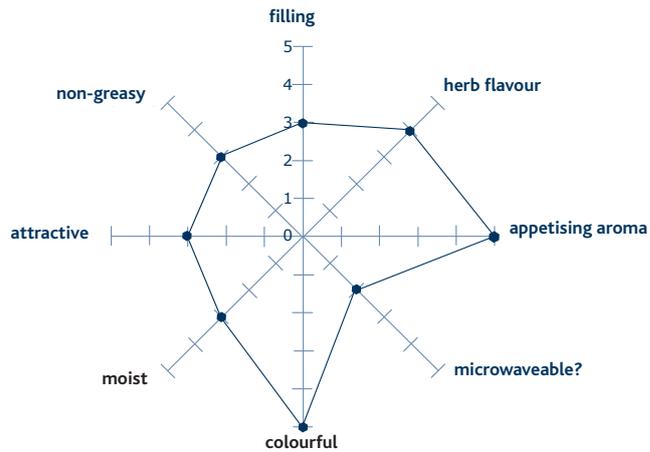
The chilli scored well on reheating in the microwave and was deemed as being filling. It was thought to be quite greasy. All other criteria gained midway scores.

Comments by potential customers

'Very similar to a shop-bought one.'

'Nice and spicy but not too hot. The soya mince was a good choice.'

'Rice was a little dried out but chilli sauce was rich and thick.'

PEPPER STIR FRY**Evaluation**

This dish had an appetising aroma and was colourful. It did not reheat well in the microwave.

Comments by potential customers

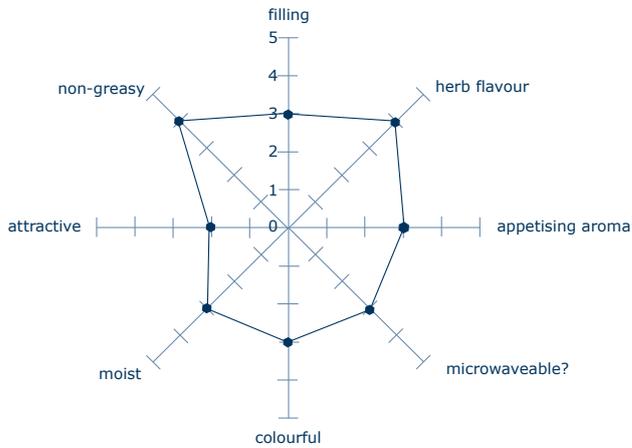
'Better outcome before reheating — everything felt 'soft''

'Wonderful range of colours and flavours.'

'Herbs are best from fresh. I don't think it reheats very well.'

Sheet 4: Attribute profiles (2)

PASTA BAKE



Evaluation

The pasta bake did not look particularly attractive and I think the cheese made it score highly on the non-greasy criteria. All other criteria scored mid way marks.

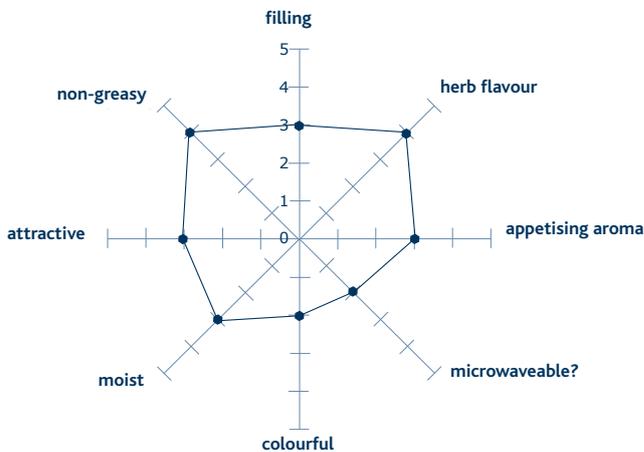
Comments by potential customers

'It was OK but nothing exciting or new.'

'It smelt better than it looked. Nice range of flavours from the veg.'

'It would be good for a quick tea — yes it could be a main meal.'

SPICY POTATO CAKES



Evaluation

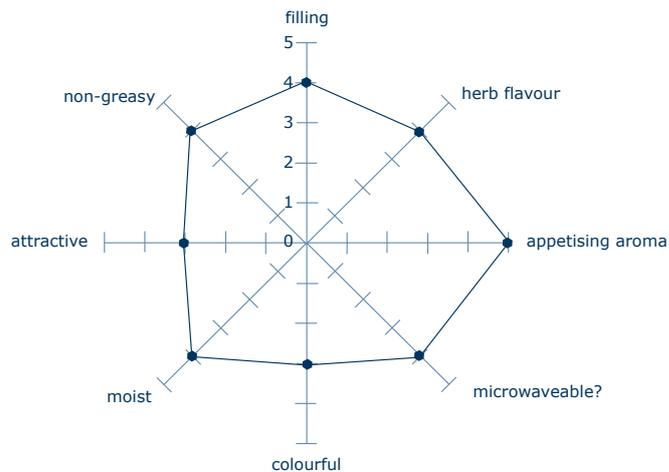
The potato cakes did not reheat well in the microwave and were rather bland in colour. It was quite greasy but had a herby flavour. All other criteria scored midway points.

Comments by potential customers

'The coating was squidgy — yuk.'

'The potato had a herby flavour and smelt quite nice'

'I don't think this would be filling enough for my main meal.'

QUORN™ BOLOGNESE**Evaluation**

The Quorn™ Bolognese had a fantastic aroma and a good herby flavour. It scored well on being filling, reheating in the microwave and being moist. It was quite greasy. All other criteria scored midway marks.

Comments by potential customers

'Smells great! It has a range of herbs.'

'It has reheated well and not lost any flavour, colour or texture.'

'It looked red in colour. Perhaps use other coloured veg for more appeal.'

Moderator comments: Sheets 3 and 4

The use of attribute profiles is a clear and succinct method used to demonstrate judgements on the products, but many of the attributes used do not appear in the design criteria and some of the design criteria points are not considered. If the student wanted to evaluate each product against all these points it might be better to provide 2 attribute profiles — one for the design criteria and one for other attributes that are considered likely to progress the design process towards a final proposal.

Commentary by potential customers is appropriate and assists in objective evaluation, but it does not address all the design criteria. The student does not go on to use these findings.

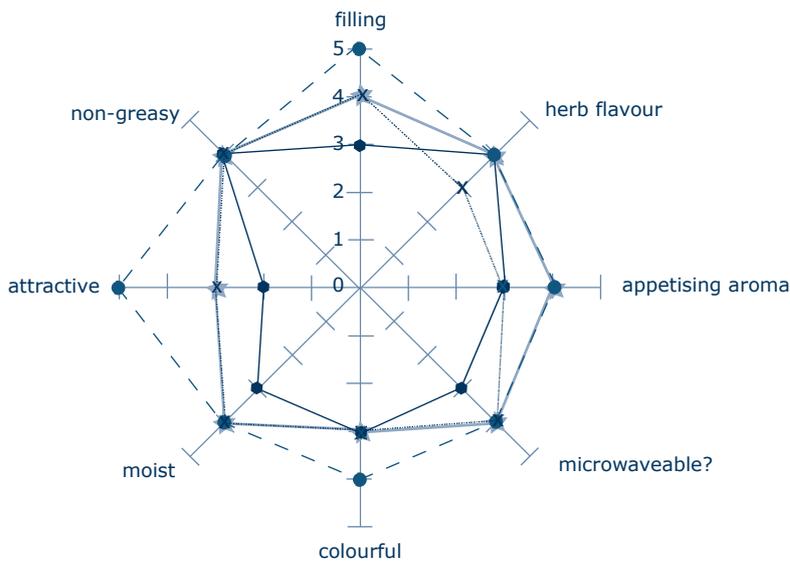
This is a section where the standard could have been raised considerably by showing higher technical knowledge and understanding of ingredients, processes and techniques — explanation of why and how problems occur and how they might be remedied. The photographic evidence supplied shows good modelling.

Sheet 5: Attribute profiles (3)

Key =

- Pasta Bake ●—————
- Moussaka ●-----
- Vegetarian chilli ✕.....
- Quorn™ Bolognese ★—————

Best match?	Spicy potato cakes	Quorn™ bolognese	Vegetarian moussaka	Pepper stir fry	Vegetarian chilli	Pasta bake
Must be savoury	✓	✓	✓	✓	✓	✓
Single portions	✓	✓	✓	✓	✓	✓
Reheat in microwave	x	✓	✓	x	✓	✓
Appeal to vegetarian teenager	✓	✓	✓	✓	✓	✓
Filling as a main meal	✓	✓	✓	x	✓	✓
Have a herby taste	✓	✓	✓	✓	✓	✓



From the 4-product attribute chart I can see that the product with the highest positive attributes is the vegetarian moussaka, scoring 5 for filling, appetising aroma and being attractive.

The dish that best fits the attribute profile and the specification points is **vegetarian moussaka** and this is the one I have chosen to develop in order for it to be marketed.

Moderator comments: Sheet 5

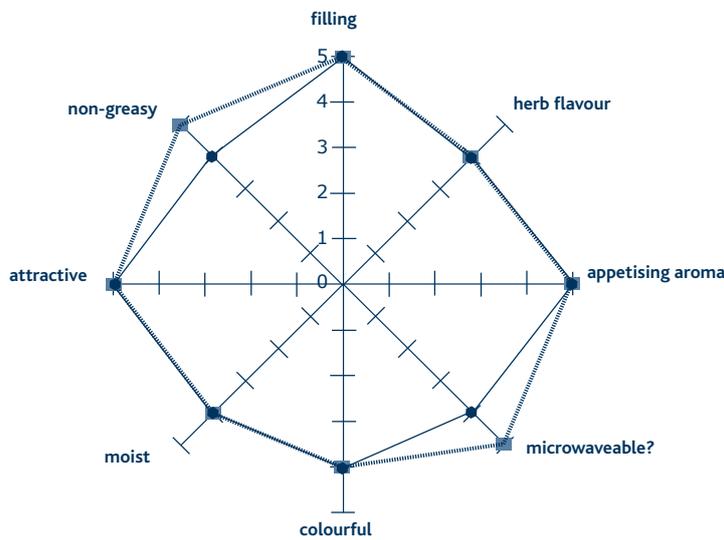
A table or check list is presented as a tool to select the proposed product that matches the design criteria most closely. While this is a good way to summarise findings and to see how a conclusion might be reached, there is not enough detailed evidence on which to make a justified decision. The student decides to develop moussaka giving a limited justification for their choice.

Sheet 6: Development of vegetarian moussaka

	Modification ideas	Effects of changes	Testing
Topping	<ul style="list-style-type: none"> • Add some homemade breadcrumbs (white) • Add wholemeal breadcrumbs • Add toasted breadcrumbs • Add yoghurt and egg for a crispy topping • Add extra cheese 	<ul style="list-style-type: none"> → added texture → added colour, texture, dietary fibre → added colour and texture → added colour, texture, protein (not for all vegetarians though) → added colour, texture, flavour, protein 	<p>Results</p> <p>9/10 preferred breadcrumb to plain</p> <p>7/10 preferred wholemeal to white fibre</p> <p>7/10 preferred toasted to plain</p> <p>10/10 liked additional cheese</p> <p>5/10 liked the yoghurt topping</p>
Filling	<ul style="list-style-type: none"> • Change beef mince to Quorn™ mince or TVP • Add fresh basil, thyme and garlic • Use courgettes, peppers, red onion • Replace aubergines with potatoes • Layer filling in different variations • Tinned or fresh tomatoes? 	<ul style="list-style-type: none"> → suitable for vegetarian, adds protein → adds colour, flavour, aroma → adds texture, colour, bulk, flavour → cheaper to produce, higher starch content → stops drying out, balance of textures and flavours, use less of expensive ingredients → reduced cost, reduced staff preparation, buy in bulk, consistent quality 	<p>Results</p> <p>Quorn™ or TVP were both acceptable — no preference shown.</p> <p>Most testers could identify basil and garlic and these were popular.</p> <p>There was no preference shown as to potato or aubergines being used.</p> <p>The most popular layering pattern was 1 base layer of vegetables, 1 layer of potato/aubergine, 1 layer vegetables, 1 layer potato/aubergine, 1 thick top layer of pouring sauce.</p> <p>6/10 testers preferred tinned tomatoes.</p>
Sauce	<ul style="list-style-type: none"> • Change colour of cheese • Change strength of cheese flavour • Pouring, coating thickness? • Skimmed milk • Roux or cornflour 	<ul style="list-style-type: none"> → add colour → use less therefore save £ and lower in fat → thickness acceptable after reheating → reduced fat content → fat content reduced, suitable for coeliacs 	<p>Results</p> <p>There was no preference for white or orange cheese.</p> <p>7/10 preferred a stronger flavoured cheese.</p> <p>The pouring sauce was preferable to the coating sauce that was too thick.</p>

Sheet 7: Final decisions based on developments

Topping	Filling	Sauce
Will be a combination of 50:50 wholemeal and white breadcrumbs. These will be toasted. Extra cheese will be mixed in with the breadcrumbs — helps stop the cheese becoming stringy.	I have chosen to use TVP as there was no preference shown and TVP is a cheaper alternative. Each batch recipe, which makes 4 portions, will contain 2 fat garlic cloves and 4 good sized fresh basil leaves. Potato will be used in place of aubergines because I am not fully convinced teenagers would like them any more than potatoes. Also potatoes are cheaper and more readily available in bulk and I want to create a new and exciting dish that will sell. The most popular layering pattern was 1 base layer of vegetables, 1 layer of potato, 1 layer vegetables, 1 layer potato, 1 thick top layer of pouring sauce. This will be used to construct the product. I suggest tinned tomatoes are used rather than fresh as they will be cheaper to buy in bulk, need less manual preparation and be consistent in texture, flavour and quality.	There was no preference in cheese colour so I'll use orange to make the product more colourful. A strong orange cheddar cheese would be suitable. The manufacturer may wish to consider buying in ready grated cheese for consistency. A pouring sauce viscosity will be used as some of the liquid evaporated during reheating making the coating sauce too thick. A cornflour sauce will allow coeliacs to eat it.



Key =
 original recipe ●
 developed recipe ■

From this sensory attribute chart it can be seen that the original recipe scored well in most parts. The developed ideas have improved the acceptability of the criteria further. The developed product is suitable for a teenage vegetarian; it has a herby flavour similar to the original recipe; it has an appetising aroma; is quite colourful; it is attractive and moist. The two areas of improvement are in the acceptability of reheating the product in the microwave — less reheating time than the original and vegetables baked for slightly less time. The developed product wasn't as greasy as the original, probably due to using a stronger flavoured cheese and using less.

**Moderator comments: Sheets 6 and 7**

A good range of component adaptations has been used, but there is limited work on processes and techniques. To raise the level of performance experimental work could have been conducted on the breadcrumbs to see how they could be made most efficiently (uses of various pieces of equipment), did toasting them have a sufficiently significant effect to justify the time and fuel involved? Experimental work could also have been done on storage to identify if the product freezes successfully.

There is much good information in the table and with evidence of how the decisions were made it could have reached a higher level of assessment.

The level could also have been raised if more information regarding how and why ingredients, techniques and processes were selected and subsequently applied as they did.

Consideration of how the product could incorporate more elaborate ingredients and presentation techniques would have lifted the response to a higher level. The Student would have benefited from exploring opportunities to make the final product significantly different and improved.

Sheet 8: Final recipe — vegetarian moussaka

Ingredients for 4 portions

300 g minced soya (TVP)
600 g potatoes, whites
200 g tinned tomatoes
2 red onions
2 courgettes
1 each green, red, yellow, pepper
2 fat cloves garlic
seasoning — salt, pepper, 4 fresh basil leaves
50 g breadcrumbs (50:50 white:wholemeal)
50 g grated orange strong cheddar cheese (top)
500 ml skimmed milk
30 g cornflour
75 g strong flavoured cheddar cheese

Method

1. Grease individual dishes. Light oven gas 5/190°C.
2. Peel onion and chop finely. Slice courgettes. Dice peppers.
3. Lightly sauté vegetables. Add TVP and brown. Add tomatoes and seasoning.
4. Cook slowly for 10 minutes on the hob. Meanwhile peel potatoes.
5. Slice potatoes into 1 cm rounds.
6. Make breadcrumbs and lightly toast under grill.
7. Make cheese sauce by blending cornflour and milk.
8. Add a layer of vegetable/soya mixture on the base of dishes.
9. Add a layer of potato. Repeat with vegetables and potato.
10. Pour over cheese sauce.
11. Mix toasted breadcrumbs with extra cheese and sprinkle over top.
12. Bake for about 25 minutes. Cool quickly.

Scaling up

Ingredients/portions	4(g)	40(kg)	400(kg)	4000(kg)
Soya mince	300	3	30	300
White potatoes	600	6	60	600
Tinned tomatoes	200	2	20	200
Red onions	2	20	200	2000
Courgettes	2	20	200	2000
3 x peppers	3	30	300	3000
Garlic cloves	2	20	200	2000
Fresh basil	4 leaves	40	400	4000
Breadcrumbs	50	.5	5	50
Strong orange cheddar top	50	.5	5	50
Strong orange cheddar sauce	75	.75	7.5	75
Skimmed milk	500 ml	5 litres	50 litres	500 litres
Cornflour	30	.3	3	30

Costing

Ingredient	Weight bought	Cost	Weight used	Cost
soya mince	454	£1.99	300	£1.31
white potatoes	2500	£1.12	600	£0.27
tinned tomatoes	400	£0.47	200	£0.24
red onions	3	£1.17	2	£0.78
courgettes	3	£1.99	2	£1.33
3 pepper pack	1	£1.29	1	£1.29
garlic cloves	10	£0.20	2	£0.04
fresh basil	100	£1.79	4	£0.07
breadcrumbs	800	£0.54	50	£0.03
strong cheddar, orange (top)	1000	£5.48	50	£0.27
strong cheddar, orange (sauce)	1000	£5.48	75	£0.41
skimmed milk	500	£0.35	500	£0.35
cornflour	250	£0.39	30	£0.05

Total cost for 4 portions = £6.44

Moderator comments: Sheet 8

A final design has been produced. The information is insufficient to reach the high level of assessment because there is a lack of detail that would allow the product to be made by a third party.

In order to reach the higher assessment level, the following could have been considered.

- Is the cheese vegetarian? (What is vegetarian cheese?)
- What kind of dish or size of dish is required? (Explore suitable types.)
- What are the vegetables to be sautéed in? There is no indication in the ingredients list or the method. (Experimental work on a variety of possible fats.)
- Was the sauce heated so that it would be thickened? This is not indicated (demonstrate knowledge and understanding of starches – types and how they function, gelatination, retrogradation etc. Why the need for agitation as thickening occurs in sauces.)
- When was the cheese added? (Demonstrate knowledge and understanding of effects of overheating protein. What colourants are used in cheese manufacture and is there a public response to colours that might affect choice?)
- How is the appearance affected by the use of cheese or cheese and breadcrumbs on top?
- Baking for 25 minutes is unlikely to be enough time to allow 1 cm slices of potato to be cooked in the oven. If the student used this method the potatoes would almost certainly be hard.
- 'Cool quickly' is not enough information. How long can a product be left to cool before chilling and still be microbiologically safe? This could have been a theoretical exercise.

The work on scaling up and costing is more appropriate to the manufacturing section and cannot be credited under product design.

The work is clearly and succinctly presented and it is easily accessible. In food projects the term 'annotation' is interpreted as the making of notes as well as, or instead of, labelling. The notes supplied in this work needed to be more technically detailed and justified to merit higher-level assessment.

Recommended websites

The following websites may be useful for students. The list is not definitive, but gives suggestions for starting points for further research.

Please note that while website addresses are checked at the time of publication, website locations may change at any time.

Unit 2: Design and Technology in Practice

Materials, components/ingredients and working properties

Carbohydrates — The chemical name, nature and basic characteristics/Fundamental working properties

www.3dchem.com (chemistry site)

www.arborcom.com (nutrition and food science)

www.ifst.org (Institute of Food Scientists and Technologists)

www.ift.org (Institute of Food Technologists)

www.nal.usda.gov/fnic (United States Department of Agriculture)

www.nutrition.org.uk (British Nutrition Foundation)

www.rsc.org (Royal Society of Chemistry)

Fats — The chemical name and basic characteristics/Fundamental working properties

www.3dchem.com (chemistry site)

www.arborcom.com (nutrition and food science)

www.ifst.org (Institute of Food Scientists and Technologists)

www.ift.org (Institute of Food Technologists)

www.nal.usda.gov/fnic (United States Department of Agriculture)

www.nutrition.org.uk (British Nutrition Foundation)

www.rsc.org (Royal Society of Chemistry)

Proteins — Nature, classification and basic characteristics/Fundamental working properties

www.3dchem.com (chemistry site)

www.arborcom.com (nutrition and food science)

www.ifst.org (Institute of Food Scientists and Technologists)

www.ift.org (Institute of Food Technologists)

www.nal.usda.gov/fnic (United States Department of Agriculture)

www.nutrition.org.uk (British Nutrition Foundation)

www.rsc.org (Royal Society of Chemistry)

Other components and additives — Name, nature and functional properties of: colours; flavours; emulsifying agents; gelling agents; stabilisers; preservatives; antioxidants; additives — nutrition; additives — aid to processing

www.3dchem.com (chemistry site)
www.answers.com/topic/food-colouring (colouring)
www.arborcom.com (Nutrition and food science)
www.benecol.com (Benecol company)
www.faia.org.uk (Food Additives and Ingredients Association)
www.foodadditivesworld.com (food additives)
www.gelatine.org (gelatine manufacturers of Europe)
www.ifst.org (Institute of Food Scientists and Technologists)
www.ift.org (Institute of Food Technologists)
www.marketresearch.com (market research)
www.rsc.org (Royal Society of Chemistry)
www.ukfoodguide.net (additives in food)

Industrial and commercial practice

Preparation

www.foodlaw.rdg.ac.uk (legislation)
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Underlying microbiological principles

www.intota.com (experts/consultants)
www.microbiologyonline.org.uk (microbiology site)

Preservation processes

www.foodadditivesworld.com (food additives)
www.sofht.co.uk (Society of Food Hygiene and Technologists)

Quality

Good Manufacturing Practice

www.campden.co.uk (Campden and Chorleywood Food Research Association)
www.fda.gov (Food and Drug Administration US)
www.mhra.gov.uk (Medicines and Healthcare Products Regulatory Agency)

Unit 3: Food Products, Nutrition and Product Development

Food commodities, chemical composition and application of manufacturing processes

Meat and fish

www.ifst.org (Institute of Food Scientists and Technologists)

www.ift.org (Institute of Food Technologists)

www.mlc.org.uk (Meat and Livestock Commission)

www.meatassociation.com (National Meat Association)

www.seafish.co.uk (Sea-fish site)

www.ukmeat.org (Food Standards Agency)

Dairy products

www.dairycrest.co.uk (milk)

www.idb.ie (Irish Dairy Board)

www.ifst.org (Institute of Food Scientists and Technologists)

www.ift.org (Institute of Food Technologists)

www.milk.co.uk (The Dairy Council)

Fruit and vegetables

www.askoxford.com (dictionary site)

www.dole.com (fruit and vegetables company site)

Eggs

www.britegg.co.uk (British Eggs)

www.crackingeggs.com (Eggs Education)

www.ifst.org (Institute of Food Scientists and Technologists)

www.ift.org (Institute of Food Technologists)

Sugar

www.britishsugar.co.uk (British Sugar)

www.ifst.org (Institute of Food Scientists and Technologists)

www.ift.org (Institute of Food Technologists)

www.sugar-bureau.co.uk (Sugar Bureau)

www.sugarinfo.co.uk (sugar site)

www.tate-lyle.co.uk (Tate and Lyle)

Fermented products

www.gruppoitalianovini.com (wine site)

www.ifst.org (Institute of Food Scientists and Technologists)

www.ift.org (Institute of Food Technologists)

Cereals

- www.grainchain.com
- www.kelloggs.co.uk (Kellogg's Cereals)
- www.quakeroats.com (Quaker Porridge)
- www.rankhovis.co.uk (Rank — Hovis site)

Nutrition

Human nutrition and diet/digestive system/nutritional recommendations and terminology/contribution of nutrients and constituents of food to the diet/contemporary issues

- www.arborcom.com (nutrition and food science)
- www.nhs.uk/livewell
- www.nal.usda.gov/fnic/ (United States Department of Agriculture)
- www.nutrition.org.uk (British Nutrition Foundation)
- www.who.ch (World Health Organization)

Product development and food innovation

Product development

- www.bbsrc.ac.uk (Biotechnology and Biological Research Council)
- www.ifr.ac.uk (Institute of Food Research)
- www.knowthis.com (marketing)
- www.marketresearch.com (market research)
- www.ncbe.reading.ac.uk (science site)
- www.novelingredient.com (novel ingredients service)
- www.ornl.gov (Oat Ridge National Laboratory)
- www.pera.com (Innovation)
- www.pma.com (Produce Marketing Association)
- www.quorn.com (Quorn™)
- www.scottish-enterprise.com (marketing)
- www.veg-soc.org/cms/html (Vegetarian Society)
- www.which.co.uk (consumer site)

Other useful websites

- www.bsi-global.com (The British Standard Association)
- www.cat.org.uk (Centre for Alternative Technology)
- www.data.org.uk (The Design and Technology Association)
- www.food.gov.uk (Food Standards Agency)
- www.hse.gov.uk (Health and Safety Executive)



Recommended textbooks

The following textbooks may be useful for students. The list is not definitive, but gives suggestions for starting points for further research.

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation at any time.

Barker C, Kimmings S and Phillips A — *GCSE Design and Technology Food Technology* (Causeway Press, 2004) ISBN 1873929625
(Although a GCSE textbook it has a good section on quality control and assurance.)

Barnett A — *Understanding Ingredients* (Heinemann, 1998) ISBN 0435428276
(Although a GCSE textbook it is a good basis for year 12 in understanding the nutritional and functionality of ingredients.)

Fox B A and Cameron A G — *Food Science, Nutrition and Health, Seventh Edition* (Hodder Arnold, 2006) ISBN 0340809485

Gaman P M and Sherrington K B — *The Science and Technology of Food, Fourth Edition* (Butterworth-Heinemann, 1996) ISBN 075062373X

Saltmarsh M — *Essential Guide to Food Additives, Second Edition* (Leatherhead Food Research Association, 2001) ISBN 0905748379

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