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General Certificate of Education (A-level)
June 2013

Design and Technology: Food Technology FOOD3

(Specification 2540)

Unit 3: Design and Manufacture

Final

Mark Scheme

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Section 1

Question 1

0 1 **Choose two of the foods listed below:**

- **soya beans**
- **minced beef**
- **lentils**
- **canned salmon.**

In each case, identify four nutrients and explain their function. Do not include protein.

You should not use any nutrient more than once.

(2 x 8 marks)

Answers may include any of the following information. Allow one mark for each nutrient and one mark for its function. If the nutritional content is just a trace, allow the mark.

Allow for Omega Oils as separate nutrients if they are mentioned (Omega 3 in oily fish, Omega 6 found in seed oils, reducing the risk of CHD and preventing ageing of the brain. Some association with dementia). If candidates provide any other accurate nutrient and function, allow the mark(s).

Do not reward 'Vitamin B' unless it is coupled with an appropriate function e.g. 'release of energy from food'.

Name of Food Per 100g	Sat Fat	Unsat. Fat	Carbohydrate	Calcium	Potassium	Phosphorus	Iron	Zinc
Soya Beans	✓	✓	✓	✓	✓	✓	✓	✓
Minced Beef	✓	✓	X	✓	✓	✓	✓	✓
Lentils	✓	✓	✓	✓	✓	✓	✓	✓
Canned Salmon	✓	✓	✓	✓	✓	✓	✓	✓

Name of Food Per 100g	Vitamin A	Vitamin B 1 Thiamin	Vitamin B2 Riboflavin	Vitamin B3 Niacin	Vitamin B6	Vitamin B12	Folate	Vitamin C	Vitamin D
Soya Beans	✓	✓	✓	✓	✓	X	✓	Tr	X
Minced Beef	Tr	✓	✓	✓	✓	✓	✓	X	Tr
Lentils	X	✓	✓	✓	✓	X	✓	Tr	X

Canned Salmon	✓	✓	✓	✓	✓	✓	✓	Tr	✓

Nutrient	Function
Fat (saturated and unsaturated)	Energy and energy stores as adipose tissue Insulation Protection of internal organs Polyunsaturated fats supply the Essential Fatty Acids Carries the fat soluble vitamins (ADEK)
Carbohydrate	Instant and slow release energy. Warmth
Calcium	Is a major constituent of bones and teeth. Helps prevent osteoporosis in later life. Important for the smooth functioning of the muscles, including the heart. Important for blood clotting and for nerve function. Helps prevent the deficiency disease 'rickets.'
Phosphorus	It is an essential part of all body cells, helping in the release of energy and regulating protein activity.
Iron	Carries oxygen from the lungs to the cells of the body. Used to make haemoglobin, which carries oxygen around the body. Can increase the resistance to infection and help the healing process. Prevents anaemia, tiredness, pallor, weakness and lack of energy.
Vitamin A	Essential for healthy eyes and vision (visual purple formation for night vision) Healthy skin and tissue Growth
Thiamin B1	Needed to release the energy from carbohydrate foods and to ensure that the brain and nerves have adequate glucose for their needs. Prevents the deficiency disease 'beriberi'.
Riboflavin B2	Involved in the release of energy, but more from fat and protein than carbohydrate. Needed to maintain healthy skin and mucous membrane (e.g. inside mouth and nose).
Niacin B3	Involved in the release of energy from food. Prevents the deficiency disease 'pellagra', which affects the skin.
Vitamin B6	Important for the metabolization of protein. Is necessary for healthy blood.
Vitamin B12	Needed for the formation of blood cells and nerves. Prevents pernicious anaemia and nerve damage.
Folate	Folic acid is necessary for the formation of blood cells and for the proper development of infants (spinal cord – embryo). Helps prevent birth defects such as spina bifida. Deficiencies can lead to CHD and megaloblastic anaemia.
Vitamin C	Important antioxidant vitamin having a protective role in the body e.g. helps cut the risk of CHD, high blood pressure; helps smokers and people under stress. Helps produce a healthy immune system Necessary for building healthy connective tissue, bones and teeth. Helps in the healing of wounds and fractures Helps in the absorption of iron. Helps reduce the length and severity of colds and to help mobilise body fat and weight loss in slimmers. Prevents the deficiency disease 'scurvy'

Vitamin D	Important for the absorption of calcium and phosphorus, helping bone formation Can help halt the progress of osteoarthritis Prevents Rickets in children
Zinc	Helps the activities of a wide variety of enzymes. Essential for normal growth and development, healthy reproductive system and fertility, healthy foetal development, keeps skin healthy, helps wounds heal, regulates the sense of taste, is important for the immune system, helps destroy surplus free radicals (has an antioxidant effect).

NB. Although NSP is not a nutrient, it is an essential part of soya and lentils. Reward candidates by one mark if they mention it in the correct context.

Criteria for marks awarded applied to each food	Mark range
A basic understanding of the nutrients. The candidate may not have covered all the food and its nutrients. It is likely that aspects of the answer will be inaccurate and the functions may be omitted.	*0 – 2 marks*
A reasonable understanding of the nutrients supplied by the food and its functions, but there may be omissions and some inaccuracies in places.	*3 – 5 marks*
A thorough and detailed account of the food and the nutrients it contains. Clear understanding of the functions.	*6 – 8 marks*

0 2 **Compare the physical structure of meat and fish.**

(6 marks)

MEAT:

- Lean meat is the flesh of the animal – it is composed of microscopic fibres which are made up of watery cells. The proteins in meat cells are *myosin* and *actin.* The size of the muscle fibres affects the tenderness. Meat composed of small, narrow fibres is more tender than meat made up of larger fibres, often developed through activity.

- Groups of fibres are held together in bundles by a thin network of connective tissue, the *endomysium.* A sheet of connective tissue called the *perimysium* surrounds the bundle of fibres.

- The connective tissue consists of two proteins called *collagen reticulum* and *elastin* (commonly known as gristle). Collagen forms gelatine when cooked, whereas elastin and reticulum does not.

- Fat (known as *invisible fat*) is found in the connective tissues of muscles, known as *marbling.* Visible fat is a creamy white colour, deposited under the animal's skin and around its internal organs.

FISH:

- Fish has a typically flaky texture that is due to the fact that fish muscle contains short fibres called *myotomes,* rather than the long fibres of animals. The myotomes are separated by thin sheets of connective tissue.

- Fish has much less connective tissue than meat and no elastin (as it is supported by water so does not need it).

- Fat is stored in the liver in white fish such as cod and is dispersed within the flesh in oily fish such herring.

Criteria for marks awarded	Mark range
A very basic understanding of the physical structures.	*0 – 2 marks*
A reasonable understanding. There may be omissions. An attempt to compare and contrast.	*3 – 4 marks*
An excellent understanding of the structures. Effective comparison between the two.	*5 – 6 marks*

0 3 **Explain why some methods of cooking are preferable for cheaper cuts of meat.**

(6 marks)

- Animals such as cows, sheep and pigs tend to live a reasonably long period of time before being slaughtered and as a result of their lifestyle, their muscles and connective tissues become developed and stronger (tougher) as they get older.

- The older the animal, the longer and thicker the muscle fibres. Parts of the animal which are used a lot, such as the legs and neck develop thick, long fibres. The more connective tissue present, the tougher the meat. These cuts of meat tend to cost less because they are less palatable, unless cooked by slow, moist cooking methods.

- Breaking the fibres down prior to cooking, either by bashing it (mechanical means), marinating it (chemical means) or mincing / dicing it small can help to tenderise the meat. *Proteolytic enzymes* are used to digest muscle fibres and connective tissue in the food industry, but foods such as figs, pineapple juice, and kiwi fruit can be used at home.

- Cooking by long, slow, moist cooking methods such as braising, stewing will convert the collagen into gelatine.

- Reward candidates for explaining why other cooking methods are not suitable, with reasons.

- Allow a mark for responses which explain why some cuts of meat are not so tender and are therefore cheaper.
- Allow a mark for naming the cheaper cuts such as ‘shin’ ‘neck’.
- Allow up to 2 marks for suitable cooking methods: stewing, braising, pot roasting, broiling, boiling.
- Allow a mark for ‘slow’ and ‘moist’ cooking methods.
- Allow a mark for reasons for non-moist, slow methods not being suitable, related to the structure.
- Reward mention of marinating, mechanical action, enzymic action in relation to tenderising tougher cuts of meat.

Criteria for marks awarded	Mark range
Very basic understanding. Little justification.	*0 – 2 marks*
The candidate recognises the reasons for the cooking methods but there may be some omissions and confusion.	*3 – 4 marks*
A thorough understanding. A full and detailed answer.	*5 – 6 marks*

Question 2

0 4 **Explain why manufacturers use sweeteners in their products. Discuss whether or not you think this is a good thing for the consumer.**

(10 marks)

Candidates may include any of the following. Reward any other point which is relevant.

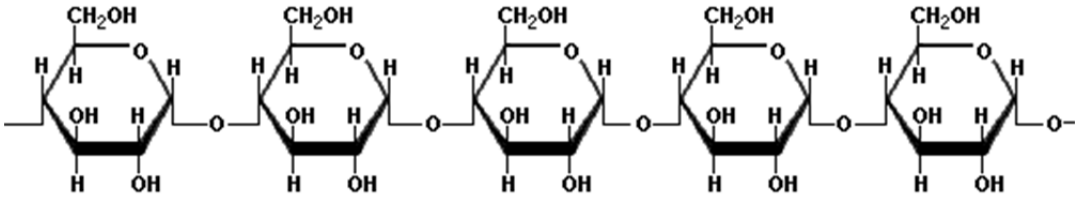
- Used to add sweetness without adding calories – good in preventing obesity and type 2 diabetes.
- Improves the nutritional profile.
- Consumers are health conscious.
- Better for dental health and dental caries than sugar, this promotes plaque.
- Sweeteners are often chemicals, which could have, as yet, undiscovered health effects.
- Some sweeteners have laxative effects.
- Consumers can become accustomed to sweetness, and thus expect many foods to have a high level of sweetness which may be unnecessary.
- Consumers may be purchasing products on the basis that they contain sweeteners, in the hope that they are low in calories, but this may not be the case.
- The sweetness of a product may be hiding the fact that low quality ingredients are being used.
- The use of sweeteners may increase or reduce the unit cost of a product.
- Concerns about some artificial sweeteners, like Saccharin, being carcinogenic.

Criteria for marks awarded	Mark range
A basic grasp of the topic. The candidate is unable to provide an effective discussion.	*0 – 2 marks*
A reasonable understanding of the topic. The candidate is able to argue effectively but the answer lacks depth or breadth.	*3 – 6 marks*
A clear understanding of the topic. The candidate displays a thorough knowledge and understanding and is able to carry out a good discussion.	*7 – 10 marks*

0 5 **Using a diagram, describe the structural form of either amylose or amylopectin.**

(6 marks)

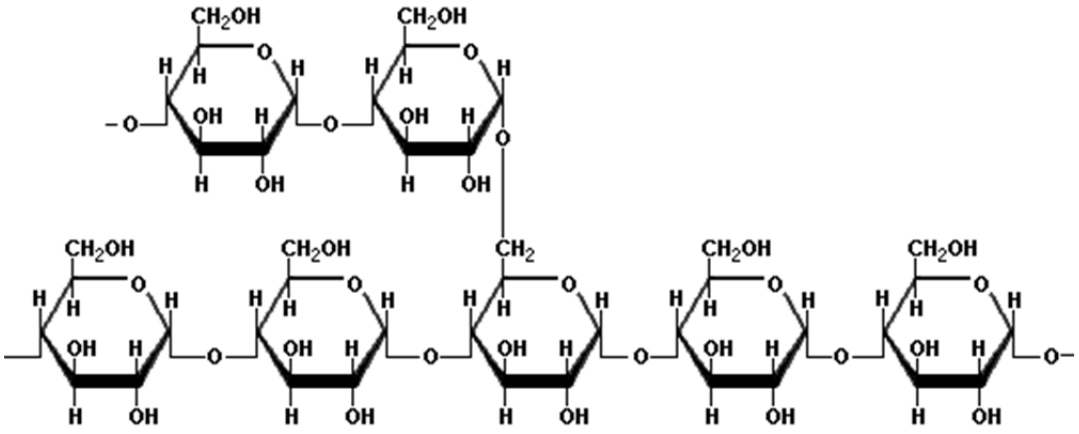
Amylose molecules consist typically of 200 to 20,000 glucose units which form a helix as a result of the bond angles between the glucose units.



Amylose

O-O-O-O-O-O-O-O-O-O-O-O

Amylopectin differs from amylose in being highly branched. Short side chains of about 30 glucose units are attached with 1α→6 linkages approximately every twenty to thirty glucose units along the chain. Amylopectin molecules may contain up to 2,000,000 glucose units.



Amylopectin

O-O-O-O
O-O-O-O-O-O-O-O-O
O-O-O-O-O-O
O-O-O-O

- Amylose is the simplest form of starch. It is a straight chain of α-glucose units. Amylopectin is composed of many shorter chains of α-glucose with many branches.

- Amylose is made up of about 300 glucose units joined together, but the number varies enormously, (can range from 50 to 500). The α-glucose units are joined by α, 1-4 glycosidic links to make a chain. The glucose units tend to spiral. There are six glucose units per turn of the spiral.

- Amylopectin is more complex in structure and is much larger than amylose. It often has many thousand glucose unit components. The glucose units are linked to form short branching chains which gives amylopectin a 'tree-like' appearance. The branches in the chain are produced by α, 1-6 glycosidic links.

- A glycosidic link is when the two glucoses condense together and water is eliminated. The remaining oxygen atoms form a bridge between the two glucoses. This bridge is called a glycosidic link.

- Allow a mark for mention of 80% amylopectin and 20% amylose as the starch content of many plants.

Criteria for marks awarded	Mark range
The candidate may not be able to describe the structural form adequately. The answer and any illustrations may show little or no understanding.	*0 – 2 marks*
The candidate has made a good attempt at describing and/or illustrating the structural form. There may be some omissions or confusion, but the main aspects are covered.	*3 – 4 marks*
A good answer which explains clearly how amylose or amylopectin is formed. Illustrations are clear and accurate.	*5 – 6 marks*

0 6 **Starch is always accompanied by enzymes which readily break it down. Describe, with examples, how this can affect the sensory characteristics of food products.**

(6 marks)

- Plant starch is always accompanied by alpha and beta amylases, known as diastase. This enzyme system works rapidly to break down starch into maltose and some dextrins.
- If a starch is used to thicken a canned soup, for example, it must be heated to ensure that no amylase activity is present. If it is then the starch-thickened soup will suddenly turn back to the viscosity of water as the enzyme breaks down the starch to dextrins.
- Roux sauces will be thinner and this will affect taste, texture and appearance.
- Bread making uses enzymes to release sugar for the yeast to become activated.
- Allow for heating, which denatures enzymes and renders them inactive.
- Allow for the description of an enzyme acting as a catalyst.

Criteria for marks awarded	Mark range
The answer which demonstrates little knowledge or understanding of the topic.	*0 – 2 marks*
A reasonable attempt. The candidate shows some understanding and is able to use one or two technical terms.	*3 – 4 marks*
A full answer in which good technical language is evident.	*5 – 6 marks*

0 7 **Describe the effect that each of the following has upon the production of a gel in a starch based sauce:**

- **proportion of amylose in the starch**
- **lemon juice**
- **sugar.**

(3 x 2 marks)

Amylose: The proportion of amylose in the starch affects the gel because amylose aids gelling and therefore high amylose starches are used where a rigid gel is needed. More likely to retrograde. If there is too much present, the starch may only partially gelatinize and the sauce may go lumpy, due to lack of available moisture. Insufficient amylose present and the sauce may not gel.

Lemon Juice: The presence of acid e.g. lemon juice hydrolyses starch and reduces gel strength forming a viscous paste. An example of this is the lemon sauce in a lemon meringue pie.

Sugar: The presence of sugar reduces gel strength because sugar competes with the starch for water, thus reducing the viscosity of the gel.

Criteria for marks awarded	Mark range
The answer is incorrect.	*0 marks*
The candidate shows some understanding but there are omissions and possibly confusion.	*1 mark*
A full and detailed answer. The candidate demonstrates a sound knowledge and understanding of the question.	*2 marks*

Question 3

0 8 **According to the Food Standards Agency (FSA) large numbers of working days are lost each year due to poor food hygiene.**

What advice on the preparation and handling of food would help to minimise the risk from bacteria and viruses linked to food?

Give detailed reasons for each piece of advice.

(16 marks)

Candidates may give any well-reasoned and relevant answer, which may cover any of the headings listed below (taken from FSA guidance to food handlers). Credit safe temperatures if accurate (0-5^{0}c / 72^{0}c / 63^{0}c / -18^{0}c etc.).

Credit also mention of HACCP, but do not reward discussion about physical and chemical contamination as this is not asked for in the question, which focuses upon bacteria and viruses.

As a general principle, allow a mark for the advice which has some explanation, followed by other mark(s) for any reason, extended discussion or relevant example.

Cross contamination

- personal hygiene
- cloths
- separating foods
- pest control
- maintenance
- physical and chemical contamination
- fridge handles, light switches

Cleaning

- cleaning effectively
- clear and clean as you go
- cleaning schedules

Chilling

- chilled storage and display
- chilling down hot food
- defrosting
- freezing

Cooking

- cooking safely
- foods that need extra care
- reheating
- hot holding
- ready-to-eat foods

Management

- training and supervision/customers
- suppliers and contractors/stock control

- product withdrawal and recall
- N.B The list above is for examiner guidance.
- Any clear point may be rewarded.

N.B The list above is for examiner guidance.

Any clear reasoned point may be rewarded.

Criteria for marks awarded	Mark range
The response provides basic and unadventurous information related to food hygiene. There will be little reasoning, justification and few examples given.	*0 – 5 marks*
The response covers a reasonable range of relevant points, with sound explanation. The candidate will attempt to make links between the different aspects of food.	*6 – 11 marks*
The response is comprehensive, covering a wide range of relevant points which are thoroughly well explained and justified. The candidate is likely to make informed links between the different aspects.	*12 – 16 marks*

0 9 **Colloidal systems have many important functions in producing food products. Describe what a colloid is and give examples.**

(12 marks)

A colloid is a kind of dispersion, for example egg white mixed with water, which does not dissolve forming a solution. Instead the molecules are dispersed throughout the water producing a heterogeneous two-phase system: the disperse phase (i.e. the substance which is dispersed) and the continuous phase (i.e. what the substance is dispersed in). In time the particles settle out due to gravity.

A colloid can be solid, liquid or gas:

	Disperse Phase	**Continuous Phase**	**Examples**
Solid foam	Gas	Solid	Meringue, Bread, cake
Foam	Gas	Liquid	Whipped cream, beaten egg white, the 'Head' on beer
Gel	Liquid	Solid	Baked egg custard, Jelly
Sol	Solid	Liquid	Uncooked custard Unset Jelly
Emulsion	Liquid	Liquid	Mayonnaise, Cream, Milk

Proteins, polysaccharides (starch) and fats are often present in foods in the form of colloids. Colloidal dispersions are fairly stable but may separate out over a

period of time, or upon mechanical agitation or freezing. The most important colloids in food science are the oil and water: *Lyophilic colloids* (hydrophilic, where there is an attraction between the colloidal particles and the liquid of the continuous phase e.g. sols and gels) and *Lyophobic colloids* (hydrophobic, where there is no attraction between the particles of the disperse phase and the continuous phase, such as emulsions).

Reward any good example of food products that contain a colloidal structure, e.g. meringue, mayonnaise, ice cream. Allow products which are part colloid, e.g. gateaux, blancmange, white sauce as long as the candidate has identified where the colloid is.

Emulsifiers are not colloids in themselves and should not be rewarded.

Criteria for marks awarded	Mark range
The candidate has little or no understanding of colloids, is unable to explain the underlying scientific principles but may be able to give accurate examples.	*0 – 4 marks*
A reasonable answer. The candidate understands the basic concept but is unable to provide many examples of foods to substantiate the answer. There may be some confusion with food science.	*5 – 8 marks*
A full answer that demonstrates a sound knowledge and understanding of colloids. The underlying food science is well explained and the candidate supports the answer with a good range of examples.	*9 – 12 marks*

Section 2

Question 4

1 0 Discuss the advantages and disadvantages of using cheap ingredients in the development of food products.

(12 marks)

Candidates may be rewarded for any valid point or well justified argument. Fully explained examples and 'for instances' should be rewarded. (NB. Some disadvantages can be considered as advantages. There may be different interpretations of the word 'cheap'):

Candidates may include some of the following in their answer:

- Consumers are increasingly governed by taste and organoleptic qualities. If a product does not taste good, it is not likely to succeed. Using cheaper ingredients can affect the overall quality.
- Building a good reputation is especially important for food producers, particularly smaller businesses who do not have existing bestselling products to fall back on.
- Cheaper ingredients are sometimes unpredictable and may let you down, e.g. cheap oil which may easily go rancid, cheap plain flour which may be low in gluten and thus may produce a weaker structure for baked products.
- There may be uncertainty about the origins of cheaper ingredients and there may be no come back if the manufacturer is unhappy.
- Many consumers are health conscious and are thus keen to purchase top quality ingredients, believing these to be better nutritionally.
- The better the ingredients, the more likely the product is to taste like the 'home-made' equivalent, which is what many consumers desire.
- Some people prefer to pay more for better ingredients and won't even consider cheaper products.
- Bad press can ruin a food company through loss of sales.
- 'Cheap ingredients' could include basic food commodities such as flour, spreads, bread, rice and pasta; but could also include foods such as chocolate 'flavour', strawberry 'flavour' or foods that are chemically contrived and contain very little in the way of nutrients at all.
- Use of additives, flavourings, flavour enhancers, bulking agents and modified starches may be mentioned.
- Some cheap ingredients such as basics: flour, pasta, rice, etc. can be nutritious and therefore very good value for money.
- Weaker responses may simply talk about making products from 'inferior'

ingredients, which means the manufacturer can buy more to generate profit and cut down on quality.

- Some candidates may mis-interpret the question and talk about the use of cheap ingredients just to develop new products, then switching to more expensive products for the actual production.

- Allow for ethical issues, such as battery farming, Fair Trade, sourcing from 'dodgy' sources, which may not comply with FSA regulations, poor standards of quality, hygiene, local sourcing.

NB Responses could also refer to producing high quality foods at a low cost e.g. local sourcing or making quality products with cheap ingredients e.g. root vegetables/ soya/ meat extenders.

Criteria for marks awarded	Mark range
The answer covers only the most obvious points with few examples.	*0 – 4 marks*
A range of different points are made, with some explanation. The range, including examples, may be limited however and some of the explanations may lack originality.	*5 – 8 marks*
A full and detailed answer which covers many different points. The explanations and examples given are likely to be original and perceptive.	*9 – 12 marks*

1 1 **For each of the following foods give a method of preservation you would recommend for sensory qualities to be retained. Give reasons for your answer.**

- **Strawberries**
- **Cooked ham**
- **Treacle sponge pudding**
- **Milk**

You should give a different method in each case.

(4 x 4 marks)

Candidates may discuss any method of preservation and may compare various methods. The answer will enable them to show a clear understanding of the preservation methods. To some extent there are few right or wrong answers as different consumers will have different tastes. However, some methods will lend themselves to better organoleptic results.

As a general principle, the following should be noted when awarding marks:

- Do not allow 'addition of preservatives' or 'spraying chemicals' on the foods

- Some candidates may talk about salting, smoking or curing in relation to

ham but curing is implicit in the production of ham, and smoking and salting are unlikely answers as they do not retain the existing sensory qualities. Likely responses will be MAP, vacuum packing, canning. Be wary of rewarding freezing unless there is a good explanation.

- Jamming for strawberries is acceptable as colour, flavour and texture to some extent is retained. Canning and drying may be acceptable if the candidate points out the sensory characteristics that are retained, e.g. colour, flavour.

- Freezing strawberries must be identified as either cryogenic or possibly freeze-drying.

- The obvious method for milk is pasteurisation to retain sensory qualities, but if candidates use UHT for HTST as an example, it can be rewarded so long as there is an explanation about the change to flavour, which is not always desirable. Drying, canning, evaporating and sterilising are too harsh in terms of retaining sensory qualities.

- Treacle sponge could be chilled, frozen, canned or vacuum packed. Plate freezing is acceptable if the sponge is frozen in its package. MAP is also acceptable, though not so commonly used.

- If candidates talk about the negative effects of the method on sensory characteristics, they may be rewarded by up to one mark, e.g. UHT generally retains the natural colour and smooth watery texture of milk but flavour and aroma is impaired by this method.

- As a general rule, award one mark for the method if it is appropriate to the question, one mark for a relevant explanation of why the method is appropriate and one mark for explanation of each of the sensory characteristics, explained with justification. Each food can be awarded up to 4 marks, which are not transferable to another part of the question.

- Do not reward a long list of sensory qualities, e.g.' colour, flavour and texture' without some clarification. Very general comments on sensory factors can only gain one mark in total.

- Do not reward a description of how the preservation method works as this is not relevant to the question.

Pasteurisation: Ideal for milk as it only reaches 72 degrees and sensory qualities are all retained.

Sterilisation: A harsh method which severely affects the colour and flavour of milk.

UHT: This is considered by some to be a good method for milk, but the sensory characteristics are affected – colour is slightly yellowed, the aroma changes as is the flavour, which can be described as 'cooked'. Because UHT milk is homogenised the texture is slightly creamier. Some may consider this to be a positive attribute.

Canning: Each of these foods can be canned, though strawberries become limp and the flavour and colour change as a result of the intense heat. Milk would

have to be evaporated or sterilised to be canned, which adds significant changes to the original food. Ham cans well and some people enjoy the jelly produced. Treacle sponge preserves well in a can.

Freezing: Each food could be preserved by this method, though strawberries will go limp when defrosted because the cells are damaged by ice crystal formation. Full fat milk does not freeze as well as skimmed and semi skimmed milk as it goes 'spotty' when defrosted.

Drying: Strawberries and milk can be dried, but the texture is altered upon rehydration. Not a suitable method for treacle sponge or ham, unless the ham is cut very small and used as part of a product which can be re-hydrated, e.g. Pot Noodle. Ham is dried somewhat during the smoking process.

Chilling: This method is suitable for all these products and in will result in the most favourable organoleptic results.

Modified Atmosphere Packaging: This is suitable for strawberries and cooked ham as the gasses used can extend shelf life without altering the organoleptic qualities. It has to be used in conjunction with chilling however.

Vacuum Packaging: Only cooked ham and possibly treacle sponge are suitable for this method (e.g. if used for expeditions, camping, army use etc.)

Salting/ Smoking: Cooked ham could be salted or smoked, but these are extreme traditional methods with distinct results in terms of flavour and colour.

Curing: This is only relevant to ham, but should not be allowed as ham is cured anyway.

Jamming: Only suitable for strawberries. The texture, flavour and colour is changed considerably from the fresh food. An example of a method of preservation is creating a completely different product which has its own organoleptic characteristics.

Pickling: Not a suitable method for any of these foods.

Irradiation: Suitable for strawberries as there are no apparent changes at all.

Criteria for marks awarded	Mark range
The candidate has only a basic understanding of the most suitable methods for these foods.	*0 – 1 marks*
A reasonable answer. The candidate is able to identify the best methods in relation to the effects upon organoleptic quality. There may be inaccuracies and omissions in places.	*2 – 3 marks*
A full and detailed answer. The candidate understands fully the methods of preservation and is able not only to discuss the effects of these methods but is also able to compare methods. The answer is original and well considered.	*4 marks*

Question 5

1 2 **Supermarkets are making greater use of technologies for market research and promotion of food products. Give three different ways in which technologies can be used for these purposes and discuss the impact of each one upon the consumer.**

(3 x 4 marks)

Three different ways in which technologies can be used:

Reward candidates one mark for each **different** method / type of technology identified and one mark for an explanation or justification. The response must look at the impact on the consumer.

Candidates may mention any of the following, though any relevant response may be rewarded:

1. **Emails** sent directly from supermarkets to the consumer who has supplied an email address.
2. Supermarket **websites** which ask for survey responses or offer money off vouchers on receipt of information such as till receipt codes, which can later be used to keep in contact with the customer.
3. **Media Technology (accept TV)** – celebrity influence via these methods
4. **Apps on Smart phones** tailored to the needs of the consumer e.g. specific information about food allergies and food intolerances or offers.
5. **Bar code** information used in conjunction with **loyalty cards** – personalised offers.
6. **Online shopping** – saving favourites
7. **QR codes** – san for information about the product
8. **Price comparison sites**
9. **CAD** – allow this if written in relation to promotion, design, advertising

NB: Three methods identified (one mark for each correct answer) with three marks for explanation per method identified.

Impact on the consumer:

- Not all consumers may feel comfortable with this. Older customers may not have access to the internet and may lose out.
- Supermarkets and phone providers are cashing in on a new market which may put undue pressure on consumers.
- Increase in food allergies and food intolerances – more information may be more readily available for consumers.
- People concerned about health issues – may help in decision making for the consumer and product development for the manufacturer.
- Higher disposable income – people may be encouraged to spend more because they can.
- De-skilled cooks who rely on supermarket products rather than making their own. Supermarkets may heavily influence their choice of food and

diet.

- Smart phone apps – a quick and easy method which will appeal to younger people especially.

- Many older people may not be able or willing to take advantage of this method.
- Discriminates against those who do not have a Smart phone etc.

- May put up the prices in order to pay for new technologies.

- May be used as a crafty way of promoting certain products or disadvantaging others.

- May encourage more internet shopping, giving people who are obese less reason to go out to the shops, thus gaining less exercise.

Any reasonable response will be credited, though repetition of the same points for each technology is not to be rewarded unless a specific example or explanation is given.

Criteria for marks awarded	Mark range
A basic response which shows a limited understanding of the question.	*0 – 1 marks*
A reasonable response. The candidate is able to cover several different points and justify most of them.	*2 – 3 marks*
An excellent response which is full and detailed and showing originality. A variety of different points have been identified, justified and discussed at a high level of understanding.	*4 marks*

1 3 **What happens in a test kitchen when manufacturers are developing new products?**

(8 marks)

Candidates will be expected to go through the stages of New Product Development (NPD) that take place in the test kitchen. Reward any relevant point and its justification.

Test Kitchen:

- This is where the initial ideas are tested to a specification. Home Economists often work in test kitchens to try out new ideas and prepare them for further development.

- The test kitchen is as it sounds – a well-equipped, but small-scale kitchen where recipes are formulated for a product. The products are made up and then subjected to tests for consistency, taste and other aspects of the specification.

- The aim is to establish what the product ought to taste like and what it should look like.

- The aim is also to prepare the way for larger scale manufacturing. Much of the groundwork in the development of a new idea takes place in the test kitchen.

- The team in the test kitchen will be highly trained and skilled, not only as cooks, but also as sensory analysts, with a good understanding of the potential market and consumer demands.

- Food technologists will also work in the test kitchen, providing specialist support. The team will amend and modify the recipe and processing method until they are satisfied with the result. In this way a reference point is developed which shows what the product must taste like and what it must look like.

- Cooking times, temperatures and cooking methods will be examined.

- Some microbial testing may take place from the products produced in the test kitchen – food samples will be taken and removed to a laboratory for incubation and identification of microbiological colonies.

- Experiments may take place with packaging materials and the effects of storage may be tested.

Criteria for marks awarded	Mark range
A basic understanding. The candidate may not understand what a test kitchen is.	*0 – 2 marks*
A reasonable answer. The candidate covers the main points though there may be omissions and some inaccuracies.	*3 – 5 marks*
An excellent response. The candidate has a very good knowledge and understanding of the test kitchen and the work that takes place in it. A well justified answer.	*6 – 8 marks*

1 4 **Outline the most important legislation in relation to food production and sale.**

(8 marks)

The response should include any information related to the following:

The Food Safety Act 1990*:* The main aim of this act is to protect the health of consumers and to prevent food fraud. This Act is the primary legislation in the UK, applying to England, Wales and Scotland. The intention of the Act is that food shall be in as wholesome a condition as possible when it is eaten. The Act came first, but has been followed by subsequent secondary legislative measures. All of this legislation prescribes legally enforceable standards of composition and treatment and renders infringement a criminal offence. The Act prohibits the addition to food any substance that would make it *'injurious to health'.* It is also required that Ministers *'have regard to the desirability of restricting, so far as practicable, the use of substances of no nutritional value as foods or ingredients of foods'.* The Act empowers Food and Health Ministers to make regulations concerning foods and, once approved by Parliament, these are published as legally binding Statutory Instruments.

The Act covers such issues as:

- Food safety (it is unlawful to sell food unfit for human consumption, or rendered harmful by the addition or removal of constituents, or by subjecting it to processes or treatments that are unreasonable. This covers microbial, foreign body or chemical contaminants).

- Substance, nature or quality (it is illegal to sell food which is inferior or substantially different to what it is purported to be, e.g. setting minimum amounts of foods for products such as fruit in fruit cocktails).

- Misleading descriptions (an offence to make a false or misleading claim on a food label or in an advertisement for a food, e.g. describing something as British when the main ingredient comes from abroad).

- Misleading presentation (this covers shape, appearance, packaging, the way things are presented for sale and the setting in which it is displayed e.g. fatty mince under red lighting to mislead consumers about its fat content).

- Individual legislation to include such things as additives, compositional standards, contaminants, hygiene and labelling.

In 1995 *The Food Safety (General Food Hygiene) Regulations 1995* were introduced to ensure that the same food hygiene rules are applied in all European countries. The Regulations must be adhered to by anyone who owns, manages or works in a food business.

Weights and Measures Act: This applies to England, Wales and Scotland. It is of particular interest to consumers because it deals with short weight (or volume). It is an offence to deliver to the buyer a lesser quantity than purported to be sold or a lesser quantity than corresponds with the price charged. Matters related to the 'Average Weight System' (**e** mark) are also covered. Packers are allowed a

tolerance on the actual weight / volume provided the average weight in a bulk lot does not fall below that stated on the package (tolerances may be +/- 15g). This ensures the consumer gets a fair deal. Some packs may be below the tolerance, but equally, some may be above it.

N.B.* Allow more marks for the Food Safety Act if necessary, as this Act is more involved

Criteria for marks awarded	Mark range *
A very basic answer that provides only the most obvious points. The candidate has a sketchy knowledge of the Acts.	*0 – 2 marks*
A reasonable answer. Understanding of the Acts is evident and several points are explained and justified. The answer may lack detail and there may be some errors.	*3 – 5 marks*
A fluent answer that shows a clear understanding of both Acts. A clear response showing excellent understanding of the principles underlying the legislation.	*6 – 8 marks*

Question 6

1 5 Some food producers are developing unique methods of packaging, presenting and delivering food products to the consumer. Explain how food retailing is changing with the times.

(10 marks)

Candidates may be rewarded for any valid point and again for any relevant justification. They do not need to stick to packaging and transporting food, the discussion can be opened up to include any other relevant factor.

Answers may include any of the following:

- On-line ordering from all types of retailers – web addresses.
- Farmers' markets, Food Fairs and Food Shows, where suppliers, producers, manufacturers and retailers can advertise and promote their products, e.g. with free tasters and then ask consumers to order from them on-line.
- Packaging developments have meant that new products can be developed, e.g. packaging in relation to food preservation, food production, presentation, storage, reheating and cooking.
- New packaging materials have been developed which enable multi-functions to take place e.g. freezer to oven plastics.
- New methods of manufacture e.g. 'cook-chill' which can result in frozen ready meals being delivered to the door. A very good method for elderly or disabled consumers. Family members can do the ordering at a distance.

- New ingredients and food additives e.g. modified starch / stabilisers, which enable food to remain stable so that they can withstand transportation.

- Refrigerated lorries with effective alarm systems in case of temperatures rising.

- Developed understanding of Food Hygiene, HACCP and Risk Assessment systems, which have made packaging and transportation safer for the consumer.

- Effective QA systems in place with the aid of CAD and CAM.

- Better research and nutritional understanding which opens the market for a variety of consumer needs, including allergy and intolerance awareness.

- Consumer access to fridges, freezers and microwaves, which has enabled the ready meal industry to boom.

- Development of air travel and sourcing ingredients and products from abroad, which can be triggered by the press of a computer button.

- The use of 'night riders' who will transport food products overnight to meet internet orders that are placed during the evening when consumers return from work.

- More flexible delivery times to suit the working person.

- Insulated delivery boxes to maximise the life of a frozen or chilled product.

Criteria for marks awarded	Mark range
A limited response. Only the most basic points are covered.	*0 – 3 marks*
A good answer. The candidate has covered several relevant points and is able to justify most of them.	*4 – 7 marks*
An excellent response which is likely to include original points. Well justified topical discussion takes place.	*8 – 10 marks*

1 6 Describe the uses of modified starches in food product design.

(12 marks)

- Food technologists have discovered that starches can be adapted or 'modified' to perform many specific functions. This includes physical and chemical modification. Mention of amylose and amylopectin will be credited.

- Modified starches are used to form gels of various types such as soft gels, quick-forming gels, stable gels, gels which will not retrograde, gels with good freeze-thaw qualities.

- An example of freeze-thaw is the thickening in fruit fillings for frozen pies, which could retrograde once thawed, making the pie soggy and unpleasant to eat. Modified starches prevent this from happening.

- All these properties have been used to make commercial products more desirable, thus improving keeping qualities and organoleptic characteristics, especially those of sauces, pizza toppings, pie fillings, cook-chill and cook-freeze meals.

- Modified starches, such as 'pre-gelatinised' starches have been used by the food industry for several decades. An example of the use of pre-gelatinised starch is in 'Angel Delight', where thickening occurs as cold milk is whisked into it, thus eliminating the need to heat it. An ideal convenience dessert dish for busy families or for small children to make.

- Pre-gelatinised starch is starch which has been gelatinized, then dried. Credit candidates for explaining this principle.

- Modified starches can be used in instant hot pot snacks, where boiling water is added and the product instantly rehydrates and thickens, ready to eat.
- Starches are presently being 'modified' to perform the same type of function as fat, but without the dietary restrictions of fat.

Any relevant answers, well described will be credited.

Criteria for marks awarded	Mark range
The candidate shows little understanding of the concept of modified starches and their uses in product design. However, some attempt may have been made to give examples.	*0 – 4 marks*
A reasonable understanding of modified starch, though there may be omissions and inaccuracies. Examples may be given but descriptions of the uses may be limited.	*5 – 8 marks*
A good understanding of the topic. The answer is detailed and may include some food science as an illustration. Response will show original thought, a wide range of examples and accurate information.	*9 – 12 marks*

1 7 Why is traceability so important in food manufacture and retail?

(6 marks)

Any relevant and justified point made will be rewarded. Candidates may include any of the following in their response:

- The term may apply to food or product in to a factory or food or products out of a factory. To be able to trace where foods have originated from or where they have been supplied to.
- The need for manufacturers to show 'Due Diligence' in order to protect themselves from litigation.
- To be able to rapidly trace any product that is thought to be unsafe for consumers to eat.
- To make product recall possible.
- For the manufacturer's own records, in line with HACCP and quality controls.
- To use as means of identifying food suppliers with the best quality food.
- To identify problems and to be in a position to act upon them rapidly.
- To identify possible sources of contamination, or to eliminate suppliers from suspicion of supplying contaminated food.

Criteria for marks awarded	Mark range
A basic response which does not offer much information.	*0 – 2 marks*
A reasonable attempt. The candidate understands the basic principle of traceability but the answer may lack depth and there may be inaccuracies.	*3 – 4 marks*
An excellent response which is accurate and perceptive and may contain some original thought.	*5 – 6 marks*

END OF MARK SCHEME