



## **General Certificate of Education**

# **Design and Technology: Food Technology 5541/6541**

*FTY6*

## **Mark Scheme**

*2007 examination - June series*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: [www.aqa.org.uk](http://www.aqa.org.uk)

Copyright © 2007 AQA and its licensors. All rights reserved.

#### COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

**Section A: Materials and Components**

- 1 (a) **Explain why it is recommended that adults should consume an average of 18 g of Non Starch Polysaccharide per day.**

Non Starch Polysaccharide (NSP) is required to aid the passage of stools during the process of digestion. It increases the weight of the stool and may help to reduce blood cholesterol. Lack of NSP (less than 12 g per day) is associated with increased risk of bowel disease. It has the benefit of ‘diluting’ colonic contents and speeding up transit, giving less time for carcinogenic action, including the development of bacteria which could trigger cancers. NSP slows the rate of absorption, thus reducing the risk of diabetes. Too much (as found in some African countries), can lead to a disease called *volvulus*. Diseases and disorders associated with NSP deficiency are:

- Constipation: infrequent bowel movement (fewer than 3 per week) and a transit time for food passing from the mouth to anus, of 5 days or more, with stools averaging below 50 g per day (when it should be above 150 g).
- Haemorrhoids: associated with constipation, where small pouches filled with blood appear.
- Diverticular disease: this is a condition where the wall of the colon produces a type of ‘blow out’, like a car tyre, caused by years of muscles having to strongly contract to transmit and expel small stools associated with a low NSP diet. It usually occurs in later life.
- Large bowel cancer: usually of the colon and rectum, caused as a result of adenomas forming. These polyps progress to being carcinomas.

Reward comment on increased recommendation from 18g to 24g or the fact that children require less because they are smaller. Do not allow conditions such as Chrones.

Criteria for Marks Awarded	Mark Range
Little understanding of the function of dietary fibre or the associated disorders.	0 – 1
Some basic understanding of the function and disorders, but the answer is incomplete and lacks depth.	2 – 3
A full answer that shows good understanding of all areas of the question.	4

**(4 marks)**

**(b) Explain the meanings of the terms**

**(i) insoluble Non Starch Polysaccharide,**

Insoluble fibre includes such foods that cannot be fully digested, such as cellulose. It comes mainly from plant cell walls. It passes undigested through the small intestine into the bowel, where it is fermented by bacteria. The foods help to increase the weight of stools, but must be consumed with fluid. They include grains such as wheat, corn and rice, dried fruits, vegetables and pulses. Allow a 'half' mark for examples.

**(2 marks)**

**(ii) soluble Non Starch Polysaccharide.**

Water-soluble fibre may help to reduce the blood levels of cholesterol by binding the bile salts derived from cholesterol, thus reducing the risk of heart disease. It controls blood sugar levels by slowing down the absorption of sugar, with may help in diabetes. Examples include pectin, citrus fruits, apples, oats, barley and ryes, pulses and dried fruits.

Soluble and insoluble NSP can be found in the same foods, but in varying amounts.

Do not allow that insoluble can be digested.

**(2 marks)**

**(2 × 2 marks)**

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
Incorrect answer or no answer submitted.	0
Some understanding, but answer is incomplete or does not give examples to support it.	1
Good understanding and a full answer, with supporting examples.	2

**(c) Describe three different ways of increasing Non Starch Polysaccharide intake in the diet.**

Any reasonable and well explained answer is acceptable, but candidates must show that they know the foods that are rich in NSP. To say 'fruit and vegetables' is not worthy of a full mark. They should identify those which are rich in either soluble or insoluble fibre. Suggested answers may contain the following:  
 Whole foods such as whole wheat flours and grains. The substitution of white for wholemeal flour of a 50 / 50 mix.  
 Use of pulses instead of. or as well as, meal in casseroles.  
 Adding dried fruits to a fruit salad.  
 Making use of brown rice and wholemeal pasta.  
 Adding oats to crumbles and sauces or barley to soups.

Question is to be marked holistically.  
 Candidates will not be penalised if they do not produce a diagram.  
 Credit good use of technical terms such as glycosidic link (will accept 'bond').

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
Little knowledge of the foods high in NSP.	0 – 2
A basic understanding of the foods rich in NSP but some confused or non-specific suggestions indicating the candidate is unsure. Some uncreative suggestions.	3 – 4
A confident and full response showing good understanding and some originality and flair in the suggestions made.	5 – 6

**(6 marks)**

- (d) **Using diagrams and/or notes, describe how starch differs from sugar in its chemical structure.**

Any form of diagram is acceptable for this answer. Candidates may wish to compare, for example, glucose with amylose or complete a series, showing how polysaccharides build up as the simple sugars combine. Full credit will be given to those candidates who are able to recall an accurate molecular diagram, though simpler versions will be accepted.

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
Poor attempt a diagram or poor explanations. Very poor understanding of the topic.	0 – 2
Some basic attempt(s) at diagrams / explanations showing some understanding of molecular structures of sugars and starches. These may be inaccuracies or confusion in the response.	3 – 4
Full answer making good use of diagrammatic representation / clear explanation. The candidate displays a thorough understanding of the differences in terms of molecular structure. Good scientific knowledge and understanding.	5 – 6

**(6 marks)**

**(e) Explain why it is recommended that starches (complex carbohydrates) are eaten in preference to sugars in order to maintain a healthy diet.**

Candidates will be expected to compare the relative nutritional advantages of starches (complex carbohydrates) over starches:

- Starches have the ability to ‘spare’ proteins. The WHO suggests that at least 50% of the calories in the diet should come from complex carbohydrates.
- Starches take longer to digest and absorb and therefore have a greater satiety value than sugars.
- *Intrinsic* sugars (those found in fruit and vegetables, forming a part of the cellular structure of the food) are considered to be preferable to the *extrinsic* sugars (those that have been ‘refined’).
- Examples of plant-based starchy foods (containing polysaccharides) are: breakfast cereals, bread, potatoes, rice, pasta, pulses, starchy vegetables and bananas.
- Starches tend not to be so detrimental to teeth, though there is growing evidence that all carbohydrates (with the exception of NSP) can cause dental caries to some degree.
- Starchy foods often provide other essential nutrients as well as carbohydrate, such as NSP, Vitamins (usually the B group) and minerals. They also provide LBV proteins.
- The *phytochemicals* are found in unrefined or marginally refined foods such as brown rice, whole-grain bread, fresh vegetables and fruits, pulses, nuts and seeds.

Responses may go on to refer to the ‘Glycaemic Index’. This grouping of carbohydrates has been topical recently and candidates who make accurate reference to high and low ‘GI’ foods and the relative benefits of eating the low GI foods, will be credited.

Credit will also be given where candidates discuss the relationship between energy expenditure and weight gain.

Criteria for Marks Awarded	Mark Range
The response is superficial and lacks real understanding.	0 – 1
A good response which covers several points with accuracy but which may be confused and lacking substance in places.	2 – 3
A well informed and clearly explained answer, which may make reference to topical advice and use nutritional terminology accurately.	4

**(4 marks)**

2 (a)

(i) Compare the nutritional characteristics of white fish and oily fish.

- All fish is a good source of protein.
- Oily fish includes such fish as herring, mackerel, salmon, pilchards and sardines. These fish include essential oils that are dispersed throughout the flesh. The composition is around 10-20% fat in oily fish, as opposed to around 1-2% in white fish.
- Oily fish contain polyunsaturated fats (PUFAs) which are essential to the body (i.e. they cannot be manufactured by the body). *Alpha-linoleic acid* (often called omega-3), together with *eicosapentaenoic acid (EPA)* and *docosahexaenoic acid (DHA)* omega oils are found in oily fish and two to three portions of these fish a week have been shown to have a beneficial effect in reducing risks of stroke and CHD.
- White fish includes such fish as plaice, cod and haddock. The oil in these fish is to be found in the fish liver, not often eaten, though cod liver oil is sold separately as a medication because of its high Vitamin A and D content. It should not be taken in excess or by pregnant women, however, as high levels of these vitamins can be detrimental to health. Fish oils are a rich source of the omega-3 fatty acids.
- Both types of fish contain the B vitamins.
- Small fish such as sardines, especially canned sardines which are eaten with the bones, are a good source of calcium.
- Fish that live a relatively short life, such as sardines, contain fewer poisons such as heavy metals. In some respects, they are likely to be safer to eat than white fish such as swordfish, which live longer and have more time to build up these metals.
- Iron – in canned sardines and mussels only
- Calcium – in whitebait, oysters and in canned sardines and salmon.

Criteria for Marks Awarded	Mark Range
The response is superficial and lacks real understanding.	0 – 1
A good response which shows a good knowledge of the main nutritional differences and similarities between the fish. Some points may be omitted.	2 – 3
A well informed and clearly explained answer. The candidate demonstrates an excellent understanding of the topic and is able to make an excellent comparison, using correct nutritional terminology.	4

(4 marks)



**(ii) Describe the reasons why fish requires a shorter cooking time than meat.**

Fish has a typically flaky texture that is due to the fact 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 (allow 'no connective tissue') and no elastin and is therefore much more tender. The fish lives a different lifestyle to animals and its body does not have to work in the same way. The life of a fish, particularly a sardine, is relatively short. Animals tend to live longer and, as a result of their lifestyle, their muscles and connective tissue become developed and stronger (tougher) as they get older, whereas this tends not to happen in fish.

Fish portions tend to be smaller and are often thinner than meat and, because there is little connective tissue and a light, flaky flesh, the heat can penetrate the fish more efficiently, hence the shorter cooking time. Best cooking methods for fish are baking, light frying, steaming or microwaving (candidates who discuss cooking methods may be credited one mark).

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
The response is superficial and lacks real understanding.	0 – 1
A good response which demonstrates a fair understanding of the structures. There may be confusion in places.	2 – 3
A well informed and clearly explained answer. Excellent understanding of the structure of fish in comparison to meat.	4

**(4 marks)**

**(iii) Explain why fish is a high risk food.**

- Fish is classed as a high risk food because it is high in protein and moisture, making it an ideal environment in which bacteria can grow.
- Fish is bred and grown in water, an ideal medium for bacterial growth. Water is often contaminated or already contains high numbers of bacteria and micro-organisms.
- Shell fish are particularly susceptible to the presence of pathogenic bacteria because of the environment they live and breed in and the way they filter food from the water bed.
- Shorter cooking times can result in some fish flesh not reaching the safe temperature for sufficient time, especially if the chef is inexperienced or the initial temperature is too hot, resulting in the outside being cooked and the inside insufficiently cooked.

Criteria for Marks Awarded	Mark Range
The response is superficial and lacks real understanding.	0 – 1
A good response which covers several points with accuracy but which may be confused and lacking substance in places.	2 – 3
A well informed and clearly explained answer, which explains all the main factors fluently.	4

**(4 marks)**

**(b) Explain what is meant by each of the following in food production.**

**(i) emulsion**

Emulsion is a stable dispersion of oil in water or vice versa. An emulsion can be either oil in water (as in milk) or water in oil (as in mayonnaise). The stability of an emulsion is usually dependent upon the presence of an emulsifier, such as *lecithin* or *glycerol monostearate (GMS)* and stabilisers. The emulsifier prevents fat droplets joining together and separating out. The stabiliser binds up quantities of water, maintaining stability once emulsification has occurred. Reward the use of the term 'colloid' / hydrophilic / hydrophobic / water loving / water hating / 'heads and tails' / immiscible. One mark maximum for examples.

**(3 marks)**

**(ii) foam**

Foams are formed when gas is mixed into a liquid, e.g. an egg white foam is a gas (air) whisked into liquid (egg white). When egg white is whisked, it stretches to hold air bubbles. The large air bubbles break down into very small air bubbles to form a foam. Examples of foams include whipped cream, ice cream and cold desserts, e.g. mousse. Foams make products light and aerated with a smooth texture. Credit 'stable' / 'unstable' foams. Allow mark for 'stabilisation'. Allow up to 2 marks if different examples given.

**(3 marks)**

**(iii) suspension**

Suspension is a solid helix in a liquid, e.g. a starchy sauce, arrowroot glaze, custard or gravy. If a suspension is left to stand, the solid grains will sink to the bottom of the liquid and will need to be stirred to keep the solids evenly mixed in the liquid. The solids in a suspension are usually held when the mixture is heated, as happens during the process of gelatinisation.

**(3 marks)**

**(iv) gel**

Gel is the resulting substance formed during the process of gelatinisation. In the case of a starch, a large quantity of water is absorbed during the formation of a gel and the starch eventually cross-links to form a three-dimensional network. Amylopectin produces a more stable gel than amylose, but gelatinises at a higher temperature. A gel is formed in jams, jellies and marmalades when *pectin* is released from the cells of a fruit during cooking. When mixed with acid and sugar, the pectin sets mixtures and forms a gel. Gelatin is a commercial protein-based gelling product made from the collagen of connective tissues, bones and skin. It has good gelling properties and is commonly found as table jelly, but can be purchased as 'Gelatine' and used to set cold desserts. Allow 'bursts' ('breaks' being the correct term) in relation to gelatinisation. Sols and gels can be animal sources as well as starch sources. A gel can be seen as the solid form of a sol.

**(3 marks)**

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
Incorrect answer or no answer submitted.	0
Some understanding, but answer is incomplete, possibly with inadequate explanations.	1 – 2
Good understanding and a full answer, well explained, making good use of technical terms.	3

## **Section B: Design and Market Influences**

- 3 Describe the stages of food product development, starting with concept development, through product launch to future developments.**

Candidates will be expected to trace stages in the development of a new product from its initial starting point as a concept, through to its launch as a completed product. They will then need to look ahead to future developments of the product. Marks will be awarded for each identifiable stage of the process and for the explanations / justifications that go with it. Candidates may not cover every possible stage, as there are so many, but a generally logical approach should be traced, with explanation and justification. The answer should show sequencing.

Suggested stages are as follows (any logical series of steps accepted):

- 1** Developing the concept. This involves thinking through the idea, asking questions, clarifying thoughts, using consultancies to help creativity, consumer research – qualitative and quantitative, discussion and decision making about the final concept.
- 2** Preparing the brief. What sort of information is required about the product, e.g. selling price, launch dates, what is realistic / unrealistic etc.
- 3** Feasibility. Studies to see if the idea is feasible, sample preparation and presentation, technical and marketplace feasibility studies. Is the product going to be viable?
- 4** Planning and project management. Looking at resources, teamwork, getting ready to produce the product, producing a good product specification.
- 5** Implementation. Producing the product on a small bench scale, pilot plant work, production scale factory trials, full scale production, HACCP, packaging, labelling, microbial testing, laboratory testing, shelf life, legal aspects, liaising with the customer.
- 6** Launch. Marketing, advertising and promotions.
- 7** Reviewing the outcome. Learning lessons, looking at feedback, continuous improvement, further market research, looking at competitors, examining possible product extensions and other future developments, e.g. developing 'ethical' versions or 'healthier' versions, new or novel packaging, different preservation methods, sources and types of ingredients, travelling the world to develop ideas further, etc.

NB the words 'concept development' and 'launch' which feature in the question can only be credited if they are explained.

Middle Mark Band only if candidates only give sequencing followed in coursework.

Higher Mark Band – must relate to industrial setting.

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
A limited answer. Some of the stages are identified, possibly in an illogical order. Explanations may be superficial or inadequate. Not all sections of the question may have been answered.	0 – 8
A reasonable attempt to cover most areas of the question. The answer is generally logical and the major stages are covered with generally sound descriptions.	9 – 16
A full and articulate answer which covers all the main areas thoroughly. Evidence of an excellent knowledge and understanding of the topic, processes clearly described throughout.	17 – 24

**(24 marks)**

**4 Explain each of the following in relation to ethical food production.**

Candidates must relate their answers to 'ethical food production'. Any well reasoned argument will be credited and marks will be awarded for examples used to justify points made.

**(a) factory farming**

There are three farming systems: intensive (conventional) agriculture, organic farming and integrated farming. 'Factory farming' could be associated with either crops or animals, but more usually people will associate it with animals. Candidates may talk about poultry as an example, where they are intensively farmed in large cages, or calves that are tethered and fed an unnatural diet to achieve the 'desired' colour and texture of flesh.

Integrated farming is often regarded as a half-way house between the two other systems, attempting to combine the best traditional approaches with appropriate modern technology to balance the need for economic production with positive environmental management.

Ethical issues include:

- animal welfare: keeping animals in unnatural conditions and feeding them on unnatural foods
- moral issues associated with man's greed for cheap and plentiful food at whatever cost, e.g. wanting chicken at the lowest price possible, demands for take away products with high protein content, wanting out of season fruits and vegetables.
- profit: producers cutting costs and choosing to ignore ethical arguments for the sake of profit.
- supermarkets: demands for large amounts of cheap, uniform weight products as and when they want them.
- Is this a positive ethical practice? More people can now eat healthily and more frequently than ever before as a result of these practices.

**(6 marks)**

**(b) growth promoters**

Can relate to animals and plants.

In order to improve efficiency in rearing livestock, some producers use hormone treatments or specially formulated diets to maximise the growth rates of animals. This raises several ethical issues:

- Is it morally right to treat animals in such a way for profit and human gain and is it actually necessary to do so?
- What are the consequences for human beings? There are concerns that feeding animals growth hormones (reward the word 'hormones') can have an undesirable effect upon humans. Should we wait and see what these are? (Think of the BSE crisis)
- Are we becoming too greedy, losing patience and expecting too much, too soon and for too little?
- Is there a way of feeding the world more efficiently?

Plants: herbicides, pesticides, fertilizers – accept these with explanation.

**(6 marks)**

**(c) genetic engineering**

/ genetic modification

This is a well debated food topic, but it does have the potential to offer vast changes in the quality, quantity and variety of food available worldwide.

- Selective breeding has been undertaken to produce food crops and improved livestock for many years. Gene technology could be seen as an extension of this, offering a more efficient and a quicker approach. It can cross species and barriers. This in itself poses a risk and many people are concerned that tampering with genes could lead to unforeseen and foreseen consequences, such as the creation of 'super weeds'.
- Advantages could include pest resistance, increased yield, better quality and nutritional aspects, quicker methods of selective breeding (which in the past has taken several generations) and greater accuracy in achieving certain characteristics.
- The Institute of Food Science and Technology sites that the advantages are considerable, including improved agricultural performance with reduced use of chemical pesticides and a greater ability for crops to grow in inhospitable environments, e.g. drought.
- People who do not have sufficient food to eat, or who live in areas susceptible to drought or flooding, could benefit.
- Flavour, texture, keeping qualities, colour of foods could improve.
- A growing world population could be fed more easily.
- Improved nutritional content could be engineered.
- Cross pollination is a worry, as is the possibility of the creation of new pathogens and allergens.
- Might GM crops produce toxic substances?

Do not allow 'chemicals': genetic engineering refers to 'genes'.

**(6 marks)**



**(d) regional and international influences**

Candidates will be expected to discuss the world market and influences associated with a narrowing of borders and world trade barriers. Issues could include:

- Air miles: the ethics associated with transporting salad ingredients and vegetables great distances at a huge environmental cost. Carbon footprints / CO<sub>2</sub> emissions.
- Consumer expectations and demands that are not always ethically or environmentally sound, such as the desire for out of season food, the desire for cheap and plentiful products, the desire to eat the same foods they have eaten in some far may have eaten in some far away region of the world at a reasonable price.
- Supermarkets selecting the most efficient suppliers to suit their specifications – even if the food has to be driven many miles to reach their shops.
- The ‘take away’ and ‘throw away’ culture, affecting resources and polluting environments with litter.
- An unwillingness to cook from raw ingredients and a reliance on supermarkets to provide ready meals.
- The desire for ‘perfect’ looking products and reluctance to grow fruit and vegetables at home.
- Fair Trade and the growing desire to pay a fair price to the producers (in the UK as well as abroad).
- A strong movement, led by the Co-Op, as well as others, for manufacturers to label, design and produce food products fairly and honestly.
- A growing awareness of other countries’ ethical standards, e.g. the heavy use of chemicals in other countries used on foods destined for Britain. Tolerance of other cultures / religious practises / cultures

**(6 marks)**

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
A limited answer which only addresses the most obvious points. The candidate may not fully understand the terms and may stray from the topic.	0 – 2
A reasonable response that conveys a good understanding of the major issues. Some discussion takes place. There may be repetition or inaccuracies in places.	3 – 4
An excellent response. The candidate is able to discuss the terms accurately and articulately, providing good examples. Originality is evident in this response.	5 – 6

**4 × 6 marks**

**Section C: Processes and Manufacture**

- 5 (a) Describe how food manufacturers maintain uniformity when producing large quantities of baked products.**

Consistency and accuracy are to be achieved as a result of several things:

- Good Quality Control and Quality Assurance systems in place
- Regular monitoring of processes and machinery
- Good product and machinery design
- Well formulated recipes that have been tried and tested before large-scale manufacturing commences
- Detailed and accurate specifications with carefully monitored tolerances
- Well trained operators / visual checks
- Good engineering and maintenance team
- Regular measurement checks of weight or volume
- Temperature checks of weight or volume
- Sensor detectors for metal or foreign bodies
- Random sampling
- A Total Quality Management (TQM) system in place
- British Standard Number BS5750
- European Standard ISO9000 for quality management systems
- Customer relations and complaints procedures
- Templates / cutters / moulds
- Use of CAM

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
A limited answer. The candidate has a weak understanding of the topic and is only able to cover the most basic and obvious points.	0 – 2
A reasonable answer which shows a good understanding. Some good ideas are expressed. There may be some confusion or repetition in places.	3 – 5
An excellent answer demonstrating originality and good understanding of the issues. Good use is made of technical language.	6 – 8

**(8 marks)**

**(b) Explain how the production system *just-in-time* is of benefit to food manufacturers.**

‘Just-in-time’ is a method of automated manufacture which uses computers to control the output of individual machines. Supply and demand concept – supply finely tuned to the demand.

- It is particularly useful because it reduces the need for storage.
- Manufacturers who operate this system do not make anything in advance and put it into store.
- Food products are only made as an order is received. This saves floor space in ambient, chilled or frozen storage facilities.
- It is used in the production of specialist bread products and in certain flavours of potato crisps, to maximise product quality (flavour, texture, colour and freshness).
- Customers feel that they are purchasing a really ‘fresh’ product.
- It is a very cost-effective and economical way of working.
- Waste is reduced.
- Outlay for stock reduced.

Criteria for Marks Awarded	Mark Range
A limited answer. The candidate has a weak understanding of the topic and is only able to cover the most basic and obvious points.	0 – 2
A reasonable answer which shows a good understanding. Some good ideas are expressed. There may be some confusion or repetition in places.	3 – 4
An excellent answer demonstrating originality and good understanding of the issues. Good use is made of technical language.	5 – 6

**(6 marks)**

**(c) How can food manufacturers make their factories more energy efficient?**

Factories are encouraged through various government grants and through public pressure to consider the environment. It is in their interests to make their manufacturing processes as efficient as possible. Ways of doing this could be:

- To work with reusable energy sources such as solar or wind power.
- To recycle supplies of waste hot water for heat transfer into heating or washroom systems.
- To create an attractive environment around the factory for locals and workers to enjoy.
- To use natural light effectively, to cut down on the need for electricity.
- To use ecologically sound building materials that will not emit contaminants to the environment (e.g. asbestos).
- To adopt modern day manufacturing processes that emit low levels of noise.
- To create a pleasant working environment within the factory to reduce stress levels for workers and to increase their productivity.
- To adopt effective systems of health and safety to protect workers.
- To recycle waste materials and use recycled packaging materials wherever possible.

Reward candidates for discussing the impact of the factory within the environment, e.g. CO<sub>2</sub> emissions from workers travelling in by car etc.

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
A limited answer. The candidate has a weak understanding of the topic and is only able to cover the most basic and obvious points.	0 – 3
A reasonable answer which shows a good understanding. Some good ideas are expressed. There may be some confusion or repetition in places.	4 – 6
An excellent answer demonstrating originality and good understanding of the issues. Good use is made of technical language.	7 – 10

**(10 marks)**

**6 (a) Explain how modified atmospheric packaging is used to extend the shelf life of food products.**

Modified atmosphere packaging is also known as ‘controlled atmosphere packaging’.

- It preserves food in sealed packs that contain a mixture of three gases: oxygen, nitrogen and carbon dioxide.
- CO<sub>2</sub> retards the growth of bacteria. Oxygen helps retain the colour of the food, e.g. meat stays red and nitrogen is used to reduce the rate of oxidation. The ratio of these gases depends upon the food being packaged.
- The food is prepared and placed in the container.
- The container is then flushed with the selected gas for the food type and is then hermetically sealed.
- MAP is often carried out in conjunction with chilling in the case of chilled meals or prepared salads.
- Once the packaging is opened the food has a normal shelf life and must be stored accordingly.

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
A limited answer. The candidate has a weak understanding of the topic and is only able to cover the most basic and obvious points.	0 – 2
A reasonable answer which shows good understanding. Some good ideas are expressed. There may be some confusion or repetition in places.	3 – 5
An excellent answer demonstrating originality and good understanding of the issues. Good use is made of technical language.	6 – 8

Allow 1 mark for mention of the gasses.

Allow 1 mark for an explanation of the product the gasses are used for, e.g. oxygen to keep meat looking red / nitrogen to stop fatty foods going rancid, e.g. nuts.

**(8 marks)**

**(b) Use examples to explain the advantages to consumers of modified atmospheric packaged food products.**

Candidates should give examples when describing why consumers like to purchase products preserved by MAP.

- The foods are packaged in peak condition and therefore present excellent organoleptic qualities.
- They can see the product through the clear pack.
- A wide range of products can be stored this way, e.g. meat, fish, smoked fish, bacon, salads, fruit, fresh pasta, bread, poppadums.
- There is an increase in shelf life by up to seven days at chill temperature, bread up to three months at room temperature.
- The colour of the food will stay the same until it is opened.
- Easy to store and stack in a fridge and freezer.
- Usually require little or no preparation.
- Little wastage.
- Usually a reliable method of preservation.

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
A limited answer. The candidate has a weak understanding of the topic and is only able to cover the most basic and obvious points.	0 – 2
A reasonable answer which shows good understanding. The answers contain examples and some good ideas are expressed. There may be some confusion or repetition in places.	3 – 5
An excellent answer demonstrating originality and good understanding of the issues. Examples are given to support the response and good use is made of technical language.	6 – 8

**(8 marks)**

**(c) Explain each of the following terms in relation to food production.**

**(i) risk assessment**

Risk assessment is a starting point for a food manufacturer in terms of Food Safety. Risk means assessing any risk to a food product during its production. This involves working out what chances there are of a food being damaged or made incorrectly. Risk assessment is therefore thinking about what could happen and planning to prevent it from happening. Allow credit for 'human safety' and 'legislation' – a requirement by law.

**(2 marks)**

**(ii) HACCP**

HACCP is a system of risk assessment used by the food industry. This approach is to analyse what could go wrong in the production of food and to set up procedures and controls to avoid any potential problems. It is an important risk assessment method and a procedure whereby the whole food company makes a commitment to quality production. Critical Control Points are integral to this process which involves controlling and monitoring risks as well as identifying the level of risk.

**(2 marks)**

**(iii) assured safe catering**

Assured safe catering is a system set up for catering establishments to ensure that the products served to the consumer are safe to eat. It examines the whole process from the supply of fresh ingredients, safe preparation, handling and storage through to hot holding of food ready to be served. Many catering establishments follow these guidelines, which are summarised in posters summarising the key points. Reward candidates for mentioning that this system is under review and may not be used any more.

**(2 marks)**

**(iv) critical path analysis**

Critical path analysis is a system used to map out the whole production process and then to identify the critical areas along the line. These, the CCPs, are stages at which action must be taken or controls monitored to ensure that no contamination can occur. Sequential.

**(2 marks)**

<b>Criteria for Marks Awarded</b>	<b>Mark Range</b>
Incorrect answer or no answer submitted.	0
Some understanding but answer incomplete or confused.	1
Good understanding and a full answer.	2

**4 × 2 marks**

### Quality of Written Communication

The following marks are allocated to the quality of the candidate's written communication. Make a separate assessment of the candidate's overall ability as demonstrated across the paper using the criteria given below.

<i>Performance Criteria</i>	Marks
<p>The candidate will express complex ideas extremely clearly and fluently. Sentences and paragraphs will follow on from one another smoothly and logically. Arguments will be consistently relevant and well structured. There will be few, if any, errors of grammar, punctuation and spelling.</p>	4
<p>The candidate will express moderately complex ideas clearly and reasonably fluently, through well-lined sentences and paragraphs. Arguments will be generally relevant and well structured. There may be occasional errors of grammar, punctuation and spelling.</p>	3
<p>The candidate will express straightforward ideas clearly, if not always fluently. Sentences and paragraphs may not always be well connected. Arguments may sometimes stray from the point or be weakly presented. There may be some errors of grammar, punctuation and spelling, but not such as to suggest a weakness in these areas.</p>	2
<p>The candidate will express simple ideas clearly, but may be imprecise and awkward in dealing with complex or subtle concepts. Arguments may be of doubtful relevance or obscurely presented. Errors in grammar, punctuation and spelling may be noticeable and intrusive, suggesting weaknesses in these areas.</p>	1