



Rewarding Learning

**General Certificate of Education
2023**

Nutrition and Food Science

Assessment Unit A2 1

assessing

OPTION A: Food Security and Sustainability

OPTION B: Food Safety and Quality

[ANF11]

WEDNESDAY 14 JUNE, AFTERNOON

**MARK
SCHEME**

General Marking Instructions

Introduction

The main purpose of the mark scheme is to ensure that examinations are marked accurately, consistently and fairly. The mark scheme provides examiners with an indication of the nature and range of candidates' responses likely to be worthy of credit. It also sets out the criteria which they should apply in allocating marks to candidates' responses.

Assessment objectives

Below are the assessment objectives for Nutrition and Food Science.

Candidates should be able to demonstrate:

- AO1** knowledge and understanding of the specified content
- AO2** the ability to apply knowledge, understanding and skills in a variety of situations and to analyse problems, issues and situations using appropriate skills
- AO3** the ability to gather, organise and select information, evaluate acquired knowledge and understanding, and present and justify an argument

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity that may reasonably be expected of a 17 or 18-year-old, the age at which the majority of candidates sit their GCE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 17 or 18-year-old GCE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Types of mark schemes

Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

Levels of response

In deciding which level of response to award, examiners should look for the 'best fit' bearing in mind that weakness in one area may be compensated for by strength in another. In deciding which mark within a particular level to award to any response, examiners are expected to use their professional judgement.

The following guidance is provided to assist examiners.

- **Threshold performance:** Response which just merits inclusion in the level and should be awarded a mark at or near the bottom of the range.
- **Intermediate performance:** Response which clearly merits inclusion in the level and should be awarded a mark at or near the middle of the range.
- **High performance:** Response which fully satisfies the level description and should be awarded a mark at or near the top of the range.

Quality of written communication

Quality of written communication is taken into account in assessing candidates' responses to all tasks and questions that require them to respond in extended written form. These tasks and questions are marked on the basis of levels of response. The description for each level of response includes reference to the quality of written communication.

For conciseness, quality of written communication is distinguished within levels of response as follows:

Level 1: Quality of written communication is basic.

Level 2: Quality of written communication is adequate.

Level 3: Quality of written communication is competent.

Level 4: Quality of written communication is highly competent.

In interpreting these level descriptions, examiners should refer to the more detailed guidance provided below:

Level 1 (Basic): The candidate makes only a limited attempt to select and use an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary. Presentation, spelling, punctuation and grammar may be such that the intended meaning is not clear.

Level 2 (Adequate): The candidate makes a reasonable attempt to select and use an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning evident.

Level 3 (Competent): The candidate makes a good attempt to select and use an appropriate form and style of writing. Relevant material is organised with a good degree of clarity and coherence. There is widespread use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

Level 4 (Highly competent): The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is succinct, well organised and displays a high degree of clarity and coherence. There is extensive and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of the highest standard and ensure that meaning is absolutely clear.

Option A: Food Security and Sustainability

AVAILABLE
MARKS

Section A

- 1 (a) Suggest reasons why some of the environmental claims made by the food industry are not helpful to consumers. (AO1, AO2, AO3)

Mark Band ([0]–[2])

Overall impression: basic

- inadequate knowledge and understanding of environmental claims made by the food industry
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to suggest reasons why some of the environmental claims made by the food industry are not helpful to consumers
- quality of written communication is basic

Mark Band ([3]–[5])

Overall impression: adequate

- adequate knowledge and understanding of environmental claims made by the food industry
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to suggest reasons why some of the environmental claims made by the food industry are not helpful to consumers
- quality of written communication is adequate

Mark Band ([6]–[8])

Overall impression: competent

- competent knowledge and understanding of environmental claims made by the food industry
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to suggest reasons why some of the environmental claims made by the food industry are not helpful to consumers
- quality of written communication is competent

Mark Band ([9]–[10])

Overall impression: highly competent

- highly competent knowledge and understanding of environmental claims made by the food industry
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to suggest reasons why some of the environmental claims made by the food industry are not helpful for consumers
- quality of written communication is highly competent

Examples of suitable points to be suggested by the candidate:

- consumers cannot verify the accuracy of the claim; it is impossible for the individual consumer to verify the accuracy of such claims so they must trust that the logo and the scheme is honest and credible
- claims are often poorly regulated; 'sustainable' is a wholly unregulated

word and appears in advertising claims without any formal definition. In the absence of enforced international standards with a clear and robust definition of the word, the food industry is defining sustainability in their own terms, leaving consumers to come to their own interpretations – which tend to vary widely

- vague 'green' terminology is often used; claims such as 'responsibly farmed' or 'sustainably sourced' can be a barrier for consumers as they are too vague to be useful
- there are too many labels; consumers can be overwhelmed and confused by the vast array of different environmental labels in use and often a logo without an explanation does not provide enough information
- environmental claims and logos are poorly understood by the majority of consumers; low level understanding of the claims means consumers are less likely to look for them, pay attention to them or choose them

All other valid points will be given credit. [10]

- (b) Comment on the positive impact organic farming may have on climate change and natural resources. (AO1, AO2, AO3)

Mark Band ([0]–[3])

Overall impression: basic

- inadequate knowledge and understanding of organic farming
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to comment on the positive impact organic farming may have on climate change and natural resources
- quality of written communication is basic

Mark Band ([4]–[7])

Overall impression: adequate

- adequate knowledge and understanding of organic farming
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to comment on the positive impact organic farming may have on climate change and natural resources
- quality of written communication is adequate

Mark Band ([8]–[11])

Overall impression: competent

- competent knowledge and understanding of organic farming
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to comment on the positive impact organic farming may have on climate change and natural resources
- quality of written communication is competent

Mark Band ([12]–[15])

Overall impression: highly competent

- highly competent knowledge and understanding of organic farming
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to comment on the positive impact organic farming may have on climate change and natural resources
- quality of written communication is highly competent

Examples of suitable points to be commented on by the candidate:

- lowers greenhouse gases; emissions of the greenhouse gases carbon dioxide and nitrous oxide are reduced because organic farming uses less artificial chemical fertilisers. The production of these fertilisers generates carbon dioxide and leads to the production of nitrous oxide
- improves carbon sequestration; organic farming principles improve the quality of soil. Healthy well managed soils capture carbon dioxide and store it as soil organic carbon, reducing greenhouse gas emissions
- reduces water pollution; water pollution from pesticides is reduced as organic farming methods do not use agricultural chemicals. Organic farming reduces pollution from nutrients such as phosphorus. The farming methods make use of rotation crops and cover crops which facilitates nutrient capture and helps recycle nutrients that would otherwise be leached through the soil and into groundwater. Even a modest addition of nutrients such as phosphorus into lakes, rivers or streams can cause nutrient imbalances that stimulate the growth of algae
- conserves water; many of the core practices of organic farming such as building soil organic matter, planting cover crops and spreading organic mulch help the soil to absorb and retain water and reduce run-off
- reduces soil erosion; organic farmers use practices that maintain a cover of growing plants over the soil surface. This prevents the eroding of soil into water bodies causing water pollution from the soil itself and from the nutrients and pathogens in the soil
- improves the quality of soil; organic farms use a diversity of crops rotated over several seasons, including fallow periods. This practice builds fertility in the soil. Healthy soil is necessary for climate change mitigation and for the prevention of soil erosion. Healthy soil encourages wildlife to help control pests and disease which reduces the use of artificial pesticides

All other valid points will be given credit.

[15]

Section A

**AVAILABLE
MARKS**

25

25

Section B

AVAILABLE
MARKS

- 2 Explore food waste as both an environmental and an ethical issue. (AO1, AO2, AO3)

Mark Band ([0]–[5])

Overall impression: basic

- inadequate knowledge and understanding of food waste
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to explore food waste as an environmental and ethical issue
- quality of written communication is basic

Mark Band ([6]–[10])

Overall impression: adequate

- adequate knowledge and understanding of food waste
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to explore food waste as an environmental and ethical issue
- quality of written communication is adequate

Mark Band ([11]–[15])

Overall impression: competent

- competent knowledge and understanding of food waste
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to explore food waste as an environmental and ethical issue
- quality of written communication is competent

Mark Band ([16]–[20])

Overall impression: highly competent

- highly competent knowledge and understanding of food waste
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to explore food waste as an environmental and ethical issue
- quality of written communication is highly competent

Examples of suitable points to be explored by the candidate:

Environmental issues

- waste of water; large quantities of water are used to produce and process food. By wasting food, consumers are wasting water. If the wasted food comes from countries already experiencing water stress, depletion of this natural resource can cause environmental problems such as salination which can render land unfit for growing crops. There is growing concern over the availability of water in the UK and other countries. It is anticipated that climate change will contribute to a decrease in water supply and population growth will cause an increase in demand, resulting in water shortages in coming decades
- contributes to greenhouse gas production; when food is wasted, the energy

used to grow, harvest, transport and package it is also wasted contributing unnecessarily to the release of carbon dioxide into the atmosphere. Food waste is broken down by bacteria to produce methane, a potent greenhouse gas. Methane and nitrous oxide are produced by ruminants and from manures and fertilisers used on the farm to produce food that is ultimately wasted

- waste of oil and fuel; oil and fuel are required to power harvesting machinery, the machinery that is used to sort, clean, package, or otherwise prepare the food and the vehicles taking the food from the farm to the warehouse to the supermarket. Food waste contributes to the waste of these valuable resources
- contributes to land degradation; using land to produce food that is then wasted results in unnecessary degradation of the land which impacts on soil fertility and soil erosion
- contributes to deforestation; deforestation is carried out to make land available for other uses including creating room for cattle ranching. This practice reduces the trees required for absorption of carbon dioxide and the trees are often burned releasing carbon dioxide
- wasting fish; wasting fish contributes unnecessarily to the problems associated with overfishing such as the destruction of marine ecosystems and natural habitats

Ethical issues

- human right; the right to food is a fundamental human right. It is unjust that so much food is thrown away while hunger and lack of proper nutrition are major health risks worldwide. People are not hungry because of the shortage of food supply in the world. More than enough food is produced globally to feed everyone. Approximately one-third of food produced for human consumption is lost or wasted globally
- an avoidable problem; causes of food loss in low-income countries are mainly connected to financial, managerial and technical limitations. However, causes of food loss and waste in medium/high income countries mainly relate to excessive consumption by consumers and it is usually avoidable
- wasting calories; wasting nutrition and calories by overeating is another form of food waste. Obesity has reached epidemic proportions in developed countries
- wasting crops; raising livestock is wasteful because a significant proportion of the crops grown is used to feed animals, rather than using the land and its resources more effectively by growing more food directly for human consumption

All other valid points will be given credit.

[20]

20

- 3 Explain why it may be more sustainable to choose local independent businesses rather than a large supermarket when buying food. (AO1, AO2, AO3)

AVAILABLE
MARKS

Mark Band ([0]–[5])

Overall impression: basic

- inadequate knowledge and understanding of sustainable food choices
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to explain why it may be more sustainable to choose local independent businesses rather than a large supermarket when buying food
- quality of written communication is basic

Mark Band ([6]–[10])

Overall impression: adequate

- adequate knowledge and understanding of sustainable food choices
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to explain why it may be more sustainable to choose local independent businesses rather than a large supermarket when buying food
- quality of written communication is adequate

Mark Band ([11]–[15])

Overall impression: competent

- competent knowledge and understanding of sustainable food choices
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to explain why it may be more sustainable to choose local independent businesses rather than a large supermarket when buying food
- quality of written communication is competent

Mark Band ([16]–[20])

Overall impression: highly competent

- highly competent knowledge and understanding of sustainable food choices
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to explain why it may be more sustainable to choose local independent businesses rather than a large supermarket when buying food
- quality of written communication is highly competent

Examples of suitable points to be explained by the candidate:

- reduced food miles; locally produced food is usually sold locally which reduces the distance the food has travelled. In their pursuit for cheap food all the year round, large supermarkets transport food over long distances contributing to production of greenhouse gas (GHG) emissions
- less vehicle pollution; locally produced food is usually sold at local outlets whereas large supermarkets are often out of town encouraging consumers to drive there, contributing to GHG emissions
- less dependence on refrigeration; locally produced food is typically fresh rather than processed. This can reduce the dependence on energy-intensive refrigeration. Refrigeration contributes to climate change both because of

the energy used to operate the equipment and because of the impact of refrigerant gases

- less waste; supermarket food is heavily packaged for ease of transportation and storage leading to waste and related pollution. Locally produced and sold food is unlikely to be heavily packaged. Large supermarkets over order to ensure shelves stay well stocked, this leads to inevitable food waste and the related implications for the environment
- promotes good farming practices; locally produced food is more likely to come from small independent farms. These farms support and believe in good farming practices that are sustainable in relation to soil health, water conservation, pollution and waste
- less use of intensive farming methods; large supermarkets have the power to determine the price they pay to farmers with farmers forced to take that price. This pressure is leading to intensive farming methods such as monoculture which is unsustainable
- encourages biodiversity; shopping at supermarkets reduces biodiversity for example there are more than 2000 apple varieties but the consumer can only choose from a small handful in the supermarket
- supports the local community; locally produced food is often sold in local independent shops and farmers markets. This is a step towards keeping custom in town centres and supporting local communities. Large supermarkets take custom away from town centres
- supports local traders; the buying power of the big supermarkets means they can cut prices making it hard for smaller shops to compete. The loss of local, independent shops can cause serious problems in terms of consumer choice. Consumer choice is important as it supports diversity in a community. Supermarkets provide a 'one size fits all' solution to retailing but local communities contain a huge diversity of people with different needs and demands. Variety and choice are important to retain community spirit
- supports the local economy; supermarkets are multinational and invest proportionately less profit into the local economy compared with independent stores

All other valid points will be given credit.

[20]

20

AVAILABLE
MARKS

4 Discuss each of the following as possible reasons for global food poverty:

- war and conflict
- poverty. (AO1, AO2, AO3)

Mark Band ([0]–[5])

Overall impression: basic

- inadequate knowledge and understanding of global food poverty
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to discuss war and conflict and poverty as possible reasons for food poverty
- quality of written communication is basic

Mark Band ([6]–[10])

Overall impression: adequate

- adequate knowledge and understanding of global food poverty
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to discuss war and conflict and poverty as possible reasons for food poverty
- quality of written communication is adequate

Mark Band ([11]–[15])

Overall impression: competent

- competent knowledge and understanding of global food poverty
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to discuss war and conflict and poverty as possible reasons for food poverty
- quality of written communication is competent

Mark Band ([16]–[20])

Overall impression: highly competent

- highly competent knowledge and understanding of global food poverty
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to discuss war and conflict and poverty as possible reasons for food poverty
- quality of written communication is highly competent

Examples of suitable points to be discussed by the candidate:

War and Conflict

- contributes to mass displacement; civil war in countries such as South Sudan has resulted in destruction of homes and communities leading to mass displacement and abandoned fields. The result is crop failure which has left 6 million people food-insecure. People flee to places with scarcity of water and precarious sanitation facilities, where they depend on humanitarian aid to survive
- destroys infrastructure; physical infrastructure needed to transport food is damaged or destroyed during war. Poor roads prevent farmers from acquiring seed and fertiliser or selling their produce. It can also restrict their access to water. Lack of water and sanitation infrastructure are leading

- causes of hunger and malnutrition
- disruption in rural areas; many conflicts take place in rural areas where small-scale farming takes place. These farmers are already struggling with poverty and hunger. War disrupts their planting or harvest cycles and leaves them even more vulnerable. Rebels and soldiers often seize the animals as food for themselves in these areas leaving the farmers in severe hunger
- increases vulnerability to climate change disasters; conflict-torn communities are more vulnerable to climate related disasters and crop or livestock failure due to climate can also contribute to social unrest
- breaks down social networks; conflict also tears apart rural communities, breaking down social networks and relationships. Farmers are left isolated and unable to get information on weather and market prices for crops. They are deprived of working cooperatively with other farmers to pool resources and obtain aid
- hunger can be used as a weapon of war; hunger can be used as a weapon of war through the systematic siege of civilians, the attack on basic water and livelihood infrastructure and the blocking of humanitarian aid. This is a growing trend in conflicts that are increasingly fought by armed groups with few military resources, who find in hunger a very cheap and viable weapon of war

Poverty

- poverty creates an incessant poverty trap; families living in poverty usually cannot afford nutritious food leading to undernourishment. In turn, undernourishment makes it difficult for people to earn more money so that they can afford healthy food. The largest group of people in the world in extreme poverty are smallholder farmers in developing countries. They do not have the land to grow enough food to supply themselves with enough to eat all year round, and they earn so little income from what they sell that they cannot afford to purchase food from other sources once their own supply runs out
- poverty leads to hunger for children; children living in poverty may rely on free school meals as their only guaranteed meal they eat in a day. Families are pushed into food poverty during school holidays because they cannot afford to pay for the food their children would have received during term time. This can also mean parents eat less or skip meals to make sure there is enough for their children to eat
- poverty reduces access to the right nutrients; poor families globally often rely on just one or two staple foods such as corn or wheat. This means they are not getting sufficient macronutrients and vitamins and may still suffer the effects of hunger. Low income families in developed countries often can only afford unhealthy food lacking nutrition. Infants and young children (especially during the 1000-day window between pregnancy and age 2) are most vulnerable to the harmful effects of malnutrition as a result of poor quality food. It has stunted the growth of 1 in 4 children in the developing world. They will suffer lifelong effects such as earlier onset of chronic diseases, difficulties learning in school and lower earning potential as adults
- poverty reduces access to healthy food choices and meals; a family may not have the facilities to store and prepare ingredients necessary to make healthy nutritious meals. Families who cannot afford private transport may have limited access to a variety of food suppliers and larger supermarkets. Smaller local stores available to them are expensive and less likely to stock fresh, healthy food supplies

All other valid points will be given credit.

[20]

20

- 5 Explain the negative impact of climate change on global food production and security. (AO1, AO2, AO3)

Mark Band ([0]–[5])

Overall impression: basic

- inadequate knowledge and understanding of climate change and food security
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to explain the negative impact of climate change on global food production and security
- quality of written communication is basic

Mark Band ([6]–[10])

Overall impression: adequate

- adequate knowledge and understanding of climate change and food security
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to explain the negative impact of climate change on global food production and security
- quality of written communication is adequate

Mark Band ([11]–[15])

Overall impression: competent

- competent knowledge and understanding of climate change and food security
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to explain the negative impact of climate change on global food production and security
- quality of written communication is competent

Mark Band ([16]–[20])

Overall impression: highly competent

- highly competent knowledge and understanding of climate change and food security
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to explain the negative impact of climate change on global food production and security
- quality of written communication is highly competent

Examples of suitable points to be explained by the candidate:

- increased global temperatures; warmer temperatures dry out the soil, reduce groundwater resources, degrade the land and in some cases, lead to desertification. This will reduce global production of staples such as rice and wheat, shrinking food supplies, particularly in food-insecure developing countries. Indirect temperature impacts include increased demand for water, water stress and reduced soil moisture, all leading to decreased yield. Globally, higher yields in temperate regions could offset lower yields in tropical regions. However many low income countries, that have limited financial capacity to trade and rely heavily on their own production to cover their food requirements, may find it impossible to offset declines in local supply without increased reliance on food aid

- increased range and distribution of weeds and pests; many weeds, pests, and fungi thrive under warmer temperatures which could increase the range and distribution of weeds and pests and lead to increases in crop damage reducing crop yield
- heat stress in livestock; heat waves threaten livestock populations. Over time, heat stress can increase vulnerability to disease, reduce fertility, and reduce milk production
- changes in temperature can affect the timing of reproduction and migration of fish; many steps within an aquatic animal's lifecycle are controlled by temperature. Combined with other climate impacts, these effects are projected to lead to a large decline in fish populations
- increased risk of drought; a decline in water availability will affect irrigation systems and food production. Drought may threaten pasture and feed supplies reducing the amount of quality forage available to graze livestock and ultimately reducing livestock populations
- increased risk of storms and flooding; wind and floods cause soil erosion with nutritious topsoil being washed away. If soil is too wet, it can result in poor conditions for the crops to grow. Flooding and wet weather cause delays in crop harvest and a subsequent reduction in yield. Arable land will be lost due to increased salinity, groundwater depletion and the rise in sea level
- reduced nutritional quality of crops; rising levels of atmospheric CO₂ reduce the concentrations of protein and essential minerals such as zinc and iron in most plant species, including wheat, soybeans, and rice. This represents a potential threat to human health
- increasing acidity of the oceans; the world's oceans are gradually becoming more acidic due to increases in atmospheric CO₂. Increasing acidity could harm shellfish by weakening their shells, which are created by removing calcium from seawater. Acidification also threatens the structures of sensitive ecosystems necessary for fish and shellfish
- damage to infrastructure; storms and hurricanes can damage key infrastructure such as roads, bridges, storage facilities and the water supply. This can interrupt food delivery and lead to food supply problems
- increases in cost of food; spikes in food prices after extreme events are expected to be more frequent in the future. This reduces access to food particularly in low-income countries

All other valid points will be given credit.

[20]

Section B

Section A

Total

**AVAILABLE
MARKS**

20

60

25

85

Section A

- 1 (a) Outline the potential risks to health in relation to mycotoxins in plants. (AO1, AO2, AO3)

Mark Band ([0]–[2])

Overall impression: basic

- inadequate knowledge and understanding of risks to health in relation to mycotoxins
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to outline the potential risks to health in relation to mycotoxins
- quality of written communication is basic

Mark Band ([3]–[5])

Overall impression: adequate

- adequate knowledge and understanding of risks to health in relation to mycotoxins
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to outline the potential risks to health in relation to mycotoxins
- quality of written communication is adequate

Mark Band ([6]–[8])

Overall impression: competent

- competent knowledge and understanding of risks to health in relation to mycotoxins
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to outline the potential risks to health in relation to mycotoxins
- quality of written communication is competent

Mark Band ([9]–[10])

Overall impression: highly competent

- highly competent knowledge and understanding of risks to health in relation to mycotoxins
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to outline the potential risks to health in relation to mycotoxins
- quality of written communication is highly competent

Examples of suitable points to be outlined by the candidate:

- acute illness; some mycotoxins cause acute symptoms with severe illness appearing quickly after consumption
- long-term risks to health; some mycotoxins occurring in food have been linked to long-term effects on health, including the induction of cancers and immune deficiency. Of the several hundred mycotoxins identified about 12 cause severe effects on human health. They are naturally occurring, so their presence in foods cannot be completely avoided

- acute poisoning from aflatoxins; the most poisonous mycotoxins, produced by moulds which grow in soil, decaying vegetation and grains. Large doses of aflatoxins can lead to acute poisoning (aflatoxicosis) and can be life-threatening, usually through damage to the liver. Aflatoxins have also been shown to be genotoxic, (damage DNA) and can cause liver cancer
- potential kidney damage; ochratoxin A is a common mycotoxin found in cereals, coffee beans, grape produce and spices. It is formed during the storage of crops. There is some evidence of potential damage to kidneys
- gastrointestinal problems; patulin is a mycotoxin often found in apple products, mouldy fruits and grains. It can cause nausea, gastrointestinal disturbances and vomiting

All other valid points will be given credit.

[10]

- (b) Describe how food traceability systems contribute to safe food production. (AO1, AO2, AO3)

Mark Band ([0]–[3])

Overall impression: basic

- inadequate knowledge and understanding of food traceability systems
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to describe how food traceability systems contribute to safe food production
- quality of written communication is basic

Mark Band ([4]–[7])

Overall impression: adequate

- adequate knowledge and understanding of food traceability systems
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to describe how food traceability systems contribute to safe food production
- quality of written communication is adequate

Mark Band ([8]–[11])

Overall impression: competent

- competent knowledge and understanding of food traceability systems
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to describe how food traceability systems contribute to safe food production
- quality of written communication is competent

Mark Band ([12]–[15])

Overall impression: highly competent

- highly competent knowledge and understanding of food traceability systems
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to describe how food traceability systems contribute to safe food production
- quality of written communication is highly competent

Examples of suitable points to be described by the candidate:

- risk-management tool; allows manufacturers to track any food, feed, food-producing animal or substance that will be used for consumption, through all stages of production, processing and distribution. Traceability is a way of responding to potential risks that can arise in food and feed. It enables manufacturers or authorities to promptly withdraw or recall products which have been identified as unsafe, e.g. concerns over microbiological, chemical or physical contamination
- provides sector-specific legislation; in addition to the general requirements, sector-specific legislation applies to certain categories of food products. There are special traceability rules for fruit and vegetables, beef, fish, honey, olive oil, seeds intended for sprouting and genetically modified organisms. In the case of animals, producers must now “tag” them with details of their origin, slaughter and the traceability code of the abattoir
- legal framework; the General Food Law 2002 makes traceability compulsory for all food and feed businesses. They must be able to identify where their products have come from and where they are going and to rapidly provide this information to the appropriate authorities. This will limit the number of consumers who suffer due to unsafe food. Many food manufacturers have implemented internal traceability to ensure the integrity of their overall traceability systems even though this is not a legal requirement
- withdrawal procedures; food may be considered unsafe if there are problems during production and distribution or if information provided to the consumer such as labelling is missing or inaccurate. When a food business believes its food is not in compliance with food safety requirements, it will immediately withdraw the food from the market. For food that has left the control of the food business they will inform the relevant authorities. If the food has reached the consumer, a product recall is undertaken which includes notification of the consumer through in-store notices and press releases
- rapid traceability through the food chain; it is recommended that food businesses trade with suppliers and businesses who also have effective traceability systems and procedures in place. Each segment of the supply chain should be able to quickly trace all the foods received and dispatched (one step forward and one step back). For food manufacturers, this will include being able to quickly trace, as required, the ingredients and packaging materials used to manufacture the finished products they distribute and/or sell

All other valid points will be given credit.

[15]

Section A

AVAILABLE MARKS

25

25

Section B

AVAILABLE
MARKS

- 2 Explain how food manufacturers can minimise the risk of microbial contamination. (AO1, AO2, AO3)

Mark Band ([0]–[5])

Overall impression: basic

- inadequate knowledge and understanding of microbial contamination
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to explain how food manufacturers can minimise the risk of microbial contamination
- quality of written communication is basic

Mark Band ([6]–[10])

Overall impression: adequate

- adequate knowledge and understanding of microbial contamination
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to explain how food manufacturers can minimise the risk of microbial contamination
- quality of written communication is adequate

Mark Band ([11]–[15])

Overall impression: competent

- competent knowledge and understanding of microbial contamination
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to explain how food manufacturers can minimise the risk of microbial contamination
- quality of written communication is competent

Mark Band ([16]–[20])

Overall impression: highly competent

- highly competent knowledge and understanding of microbial contamination
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to explain how food manufacturers can minimise the risk of microbial contamination
- quality of written communication is highly competent

Examples of suitable points to be explained by the candidate:

- carry out effective cleaning; unhygienic conditions allow the build-up of complex biofilms, which protect microorganisms from cleaning and sanitising agents, once established these can be extremely difficult to remove
- maintain hygienic premises; to comply with regulations and prevent cross-contamination, manufacturers must supply sufficient wash hand basins with hot and cold running water, materials for drying hands hygienically and facilities to allow staff to change clothes. Premises must also have adequate ventilation and drainage to prevent conditions suitable for microbial growth and good lighting to aid effective cleaning. Manufacturers must control any infestation of pests
- maintain hygienic equipment; must be kept in good order, cleaned effectively and disinfected frequently. Separate sinks must be provided, where

necessary, for washing food and cleaning equipment. Vacuum packers, slicers and mincers are not to be dual used as there is a risk of cross-contamination, they should be fully dismantled and disinfected between uses to minimise the risk of microbial contamination

- train staff in good personal hygiene practices; legally, manufacturers must ensure that food handlers receive the appropriate supervision and training in food hygiene, which is in-line with the area they work in. Those responsible for HACCP should also receive adequate training
- take steps to prevent cross-contamination; raw and ready-to-eat food should be separated during delivery, handling, storage and preparation by designating an area for ready-to-eat food only (clean area). Unwashed fruit and vegetables can be a source of E.coli 0157 and these must also be stored separately
- appropriate food storage; fridge temperature should be checked daily, manufacturers should avoid over-stocking to allow cold air to circulate. Cook-chill foods should not be stored for more than 5 days as listeria bacteria can multiply at -1.5 °C. Freezers should operate at a temperature of at least -18 °C. Dry foods should be stored in rooms which are clean, dry and well ventilated. Date codes should be checked regularly and stock rotated
- correct use of temperature when cooking and cooling food; manufacturers can use temperature probes; the Food Standards Agency recommend 75 °C or hotter to thoroughly kill food poisoning bacteria. Once cooked, food should be cooled quickly and placed in the fridge/freezer within two hours. Industrial blast chillers are designed to chill hot foods quickly and safely
- Meat Industry Guide; sets out the legal obligations and advice that apply to food manufacturers in the meat sector. It is aimed at businesses involved in the slaughter, cutting and processing of fresh meat where the risk of microbial contamination may be high
- employ a range of quality assurance systems; food manufacturers can also ensure safe food production by employing a range of quality assurance systems. Good Manufacturing Practice ensures that food products are controlled to high standards. Quality assurance standards such as Lion's Eggs will reduce the risk of salmonella contamination. Traceability helps minimise potential risk of microbial contamination. HACCP is a food safety management system which can help the manufacturer identify and minimise any microbiological risks

All other valid points will be given credit.

[20]

20

- 3 “Allergic diseases are affecting the lives of more than one billion people worldwide. With an epidemic rise during the last 60 years, their prevalence is expected to reach up to 4 billion in 2050s.” *Source: Anaphylaxis Campaign 2019*

Consider the possible reasons for this expected increase in food allergies.
(AO1, AO2, AO3)

Mark Band ([0]–[5])

Overall impression: basic

- inadequate knowledge and understanding of food allergies
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to consider possible reasons for this expected increase in food allergies
- quality of written communication is basic

Mark Band ([6]–[10])

Overall impression: adequate

- adequate knowledge and understanding of food allergies
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to consider possible reasons for this expected increase in food allergies
- quality of written communication is adequate

Mark Band ([11]–[15])

Overall impression: competent

- competent knowledge and understanding of food allergies
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to consider possible reasons for this expected increase in food allergies
- quality of written communication is competent

Mark Band ([16]–[20])

Overall impression: highly competent

- highly competent knowledge and understanding of food allergies
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to consider possible reasons for this expected increase in food allergies
- quality of written communication is highly competent

Examples of suitable points to be considered by the candidate:

- increased awareness of allergic diseases; a possible reason for expected increases is growing awareness and better diagnostics. Both of these have improved in the last 60 years and are likely to continue to improve into the 2050s. However, increased awareness leads to misdiagnosis and possible confusion with food intolerance which could explain some of the increased prevalence
- pollution; rates of pollution in the last 60 years have increased to high levels. It has been suggested that high rates of pollution can exacerbate existing airway allergy and change how the immune system responds

- dietary changes: the rate of allergies has increased in line with the increasing popularity of processed food in the last 60 years. In conjunction with this some consumers are eating less fresh fruit and vegetables; scientists have discovered a link between the lack of intake during childhood and inadequate development of a normal immune system. Many consumers have switched from eating saturated fats to consuming unsaturated margarines and processed foods; experts believe this is responsible for stimulating the immune system in a way that can cause damage
- vitamin D deficiency: deficiency of vitamin D is increasing throughout the world because of sunlight avoidance through spending more time indoors and more use of sunscreen. Vitamin D plays an important role in immunoregulatory mechanism
- reduced exposure to microbes; modern homes and the current emphasis on very high hygiene standards results in reduced exposure to microbes that help the immune system to respond to foreign substances
- weakened immune system from overuse of vaccines and antibiotics; some scientists propose that these weaken the immune system. There is good evidence that the more antibiotics given to a child, the more likely they will be to develop a food allergy. The antibiotics kill the healthy bacteria that colonise the gut. Increased prevalence of food allergies could also be a consequence of global blanket vaccination programmes
- poor breastfeeding rates; rates of breastfeeding are declining in modern society. Breastfeeding for at least four months is needed for a good immune system. The antibodies of the mother are transferred to the infant and the immune system becomes strengthened
- genetics; children born into families where allergies already exist have a higher than average chance of developing allergies themselves. As rates increase, so too will the genetic predisposition to develop an allergy contributing to rising cases of food allergies by 2050
- allergen exposure; early advice suggested that allergenic foods should be avoided in childhood. This has been revised and it is now recommended to introduce allergenic foods as early as possible. However, parents are still fearful and continue to avoid allergenic foods which could inadvertently lead to increasing prevalence of food allergies
- pregnancy; consuming maternal folic acid supplementation in a dosage higher than recommended may be a risk factor for allergy development. Babies born via caesarean section have an increased risk of food allergies, this method of delivery has increased in recent years

All other valid points will be given credit.

[20]

20

4 Explore the controversy surrounding the use of food additives. (AO1, AO2, AO3)

AVAILABLE
MARKS

Mark Band ([0]–[5])

Overall impression: basic

- inadequate knowledge and understanding of food additives
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to explore the controversy surrounding the use of food additives
- quality of written communication is basic

Mark Band ([6]–[10])

Overall impression: adequate

- adequate knowledge and understanding of food additives
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to explore the controversy surrounding the use of food additives
- quality of written communication is adequate

Mark Band ([11]–[15])

Overall impression: competent

- competent knowledge and understanding of food additives
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to explore the controversy surrounding the use of food additives
- quality of written communication is competent

Mark Band ([16]–[20])

Overall impression: highly competent

- highly competent knowledge and understanding of food additives
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to explore the controversy surrounding the use of food additives
- quality of written communication is highly competent

Examples of suitable points to be explored by the candidate:

Controversy surrounding the use of colours:

- cosmetic advantages; food manufacturers claim that colour is an important sensory quality and is often associated with a specific flavour, e.g. red for strawberry. They maintain that the primary reason for adding colours to food is to offset colour loss which would otherwise be unacceptable to consumers. However, those against the use of colours argue that the health risks, though small outweigh substantially the cosmetic benefits of additives
- health risks to children; food colours have been linked to hyperactivity and Attention Deficit Hyperactivity Disorder in some children and this is sufficient for many consumers to campaign against their use. However, the exact cause of these health conditions remains unknown and there is unlikely to be only one cause
- unhealthy diet; colours are used by the food industry to make the food brighter and more appealing. However, these foods tend to be high in

calories with little other nutritional value. Artificial food colours may thus encourage the consumption of an unhealthy diet, which is linked to many health problems, such as obesity and cardiovascular disease.

- reduced use; some manufacturers are working towards finding alternatives to colours and some have already taken action to remove them from their food in response to consumer concerns. However, many campaign groups claim this is not enough

Controversy surrounding preservatives:

- food waste; according to the food industry there are sound economic, ethical, environmental and food safety reasons for the use of preservatives. Foods with preservatives have a longer shelf life which may reduce food wastage and improve food safety. However, the large volume of food wasted every day in the UK suggests that these may not be convincing arguments
- nitrites and nitrates; there are concerns surrounding sodium nitrate used as a preservative in bacon, processed meat and smoked foods as there is evidence linking them to cancer development. However, nitrites and nitrates are naturally present in vegetables such as spinach, lettuce, celery and beetroot. These are the main sources of dietary exposure to nitrates with only 5% coming from its use as a food additive. The Food Standards Agency (FSA) considers that existing levels of nitrites and nitrates are sufficiently protective for consumers

Controversy surrounding sweeteners:

- calorie intake; food and drink manufacturers use bulk and intense sweeteners to impart a sweet taste to foodstuffs and claim they are useful in low-calorie products and for special dietary products, such as those for diabetics. Food manufacturers argue that these products can play a valuable role in our obesogenic society to help reduce calorie intake. However, these products do not necessarily encourage a healthy balanced diet which has nutritional benefits beyond just reduced calorie intake
- sensitivity to aspartame; there is controversy around the use of the sweetener aspartame. Reported concerns include headaches, dizziness and stomach upsets. The FSA commissioned research to investigate these concerns and concluded that only people diagnosed at birth with phenylketonuria need to avoid foods containing aspartame

Controversy surrounding flavour enhancers:

- monosodium glutamate (MSG); the flavour enhancer, monosodium glutamate (MSG) has been held responsible for a wide range of reactions. However, scientific studies show no link between MSG and the reactions suggesting that some other component of the meal, or even psychological responses, may be responsible. The case against MSG remains unproven, but there remains a large body of respected nutritionists who are sure that MSG causes problems for many people, especially children

All other valid points will be given credit.

[20]

20

- 5 Explain the role of the Department of Agriculture, Environment and Rural Affairs (DAERA) in relation to animal health and food safety. (AO1, AO2, AO3)

AVAILABLE
MARKS

Mark Band ([0]–[5])

Overall impression: basic

- inadequate knowledge and understanding of the role of DAERA
- demonstrates a limited ability to apply appropriate knowledge and understanding to the question
- demonstrates a limited ability to explain the role of DAERA in relation to animal health and food safety
- quality of written communication is basic

Mark Band ([6]–[10])

Overall impression: adequate

- adequate knowledge and understanding of the role of DAERA
- demonstrates an adequate ability to apply appropriate knowledge and understanding to the question
- demonstrates an adequate ability to explain the role of DAERA in relation to animal health and food safety
- quality of written communication is adequate

Mark Band ([11]–[15])

Overall impression: competent

- competent knowledge and understanding of the role of DAERA
- demonstrates a competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a competent ability to explain the role of DAERA in relation to animal health and food safety
- quality of written communication is competent

Mark Band ([16]–[20])

Overall impression: highly competent

- highly competent knowledge and understanding of the role of DAERA
- demonstrates a highly competent ability to apply appropriate knowledge and understanding to the question
- demonstrates a highly competent ability to explain the role of DAERA in relation to animal health and food safety
- quality of written communication is highly competent

Examples of suitable points to be examined by the candidate:

- develop disease control strategies; DAERA has developed control strategies in relation to several animal diseases, e.g. Foot and Mouth Disease and Swine Fever. Pig Text Alert is a service for all pig-keepers to receive immediate notifications of disease outbreaks which prevents the spread of disease. They provide advice on the use of approved disinfectant procedures (essential for maintaining good biosecurity) and the cleansing and disinfection of vehicles used for the transport of animals and poultry to help prevent the spread of disease
- monitor the implementation of food hygiene regulations; DAERA's Agri-food Inspection Branch carries out work on behalf of the FSA. This involves making farmers aware of their legal responsibilities, providing guidance on compliance with the regulations and also implementing inspections, audits and testing. All primary producers must comply with these regulations to control potential food hazards at farm level. Inspection frequencies are

risk-based and farms with membership to an assurance scheme will be identified as lower risk

- delivers training and education courses; the Department’s College of Agriculture, Food and Rural Enterprise (CAFRE) delivers training and education courses in the agri-food sector that will help ensure food safety is at the forefront of food production and innovation. The Food Technology Development Branch has dedicated teams devoted to food safety training programmes
- animal welfare; DAERA is responsible for farmed animals. Officers investigating animal welfare related complaints can take a range of actions. This will stop animals that may be in poor health getting into the food chain
- control antimicrobial resistance; an action plan for Northern Ireland has been drawn up to tackle this issue. DAERA manage the development and delivery of key activities in the NI Action Plan. This will help implement the changes needed to bring the spread of antimicrobial resistance under control. DAERA also support industry led initiatives, surveillance, research and dissemination of relevant information and advice
- control fish disease; DAERA Fish Health Inspectorate undertake routine inspection and sampling of aquaculture production businesses. They also carry out routine sampling of wild fish stocks, inspect live fish and shellfish destined for import into, and export from, Northern Ireland, and issue movement documentation. If DAERA believe waters are infected with a notifiable disease, they will take measures to prevent, control and eradicate the disease
- safety of milk and milk products; the milk inspectorate team carries out inspections and provides guidance on legislation relating to milk production. They are also responsible for the enforcement of legislation on milk production premises and in plants producing liquid milk products
- safety of meat; DAERA has a central role in approved slaughter and cutting establishments through the Veterinary Public Health Programme (VPH) whose primary aim is to ensure food businesses produce safe food. The VPH also maintains vigilance for animal diseases. Export capability and veterinary certification of meat is another function of the service in meat premises
- safe production of eggs; DAERA inspects and enforces specific requirements on egg production sites. The guidance produced by the FSA covers requirements for birds and housing, egg collection and storage, hygiene control and personnel. They also provide guidance on legislation relating to egg packers
- safety of feed and food for producing animals; farmers that feed animals and/or produce crops for animal feed must ensure feed safety for food producing animals. Animal feeds inspection, sampling and enforcement work is undertaken. This involves inspection of establishments, checks on imports of animal feed and inspection of farm facilities for production of animal feeds. DAERA also works on behalf of Veterinary Service in relation to Transmissible Spongiform Encephalopathy (TSE) to help maintain the integrity of the local feed food chain

All other valid points will be given credit. [20]

Section B

Section A

Total

**AVAILABLE
MARKS**

20

60

25

85