Food & Nutrition subject report

2025 cohort

January 2026

Queensland Government
QCAA Queensland Curriculum & Assessment Authority

260043

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Contents

Introduction

The annual subject reports seek to identify strengths and opportunities for improvement of internal and external assessment processes for all Queensland schools. The 2025 subject report is the culmination of the partnership between schools and the QCAA. It addresses school-based assessment design and judgments, and student responses to external assessment for General and General (Extension) subjects. In acknowledging effective practices and areas for refinement, it offers schools timely and evidence-based guidance to further develop student learning and assessment experiences for 2026.

The report also includes information about:

- how schools have applied syllabus objectives in the design and marking of internal assessments
- how syllabus objectives have been applied in the marking of external assessments
- patterns of student achievement
- important considerations to note related to the revised 2025 syllabus (where relevant).

The report promotes continuous improvement by:

- identifying effective practices in the design and marking of valid, accessible and reliable assessments
- recommending where and how to enhance the design and marking of valid, accessible and reliable assessment instruments
- providing examples that demonstrate best practice.

Schools are encouraged to reflect on the effective practices identified for each assessment, consider the recommendations to strengthen assessment design and explore the authentic student work samples provided.

Audience and use

This report should be read by school leaders, subject leaders, and teachers to:

- inform teaching and learning and assessment preparation
- assist in assessment design practice
- assist in making assessment decisions
- help prepare students for internal and external assessment.

The report is publicly available to promote transparency and accountability. Students, parents, community members and other education stakeholders can use it to learn about the assessment practices and outcomes for senior subjects.

Subject highlights

95.70%
of students received a C or higher

75.50%
of students completed 4 units

6%
improvement in endorsed IA2 at Application 1

Subject data summary

Unit completion

The following data shows students who completed the General subject.

Note: All data is correct as at January 2026. Where percentages are provided, these are rounded to two decimal places and, therefore, may not add up to 100%.

Number of schools that offered Food & Nutrition: 70.

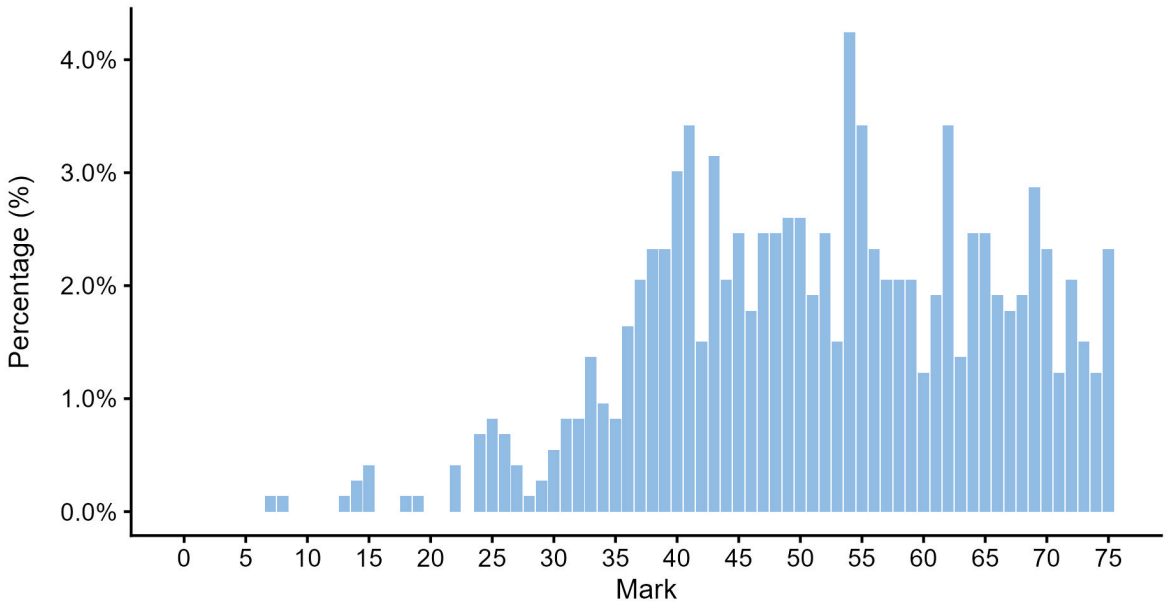
Completion of units	Unit 1	Unit 2	Units 3 and 4
Number of students completed	955	865	721

Units 1 and 2 results

Number of students	Unit 1	Unit 2
Satisfactory	792	754
Unsatisfactory	163	111

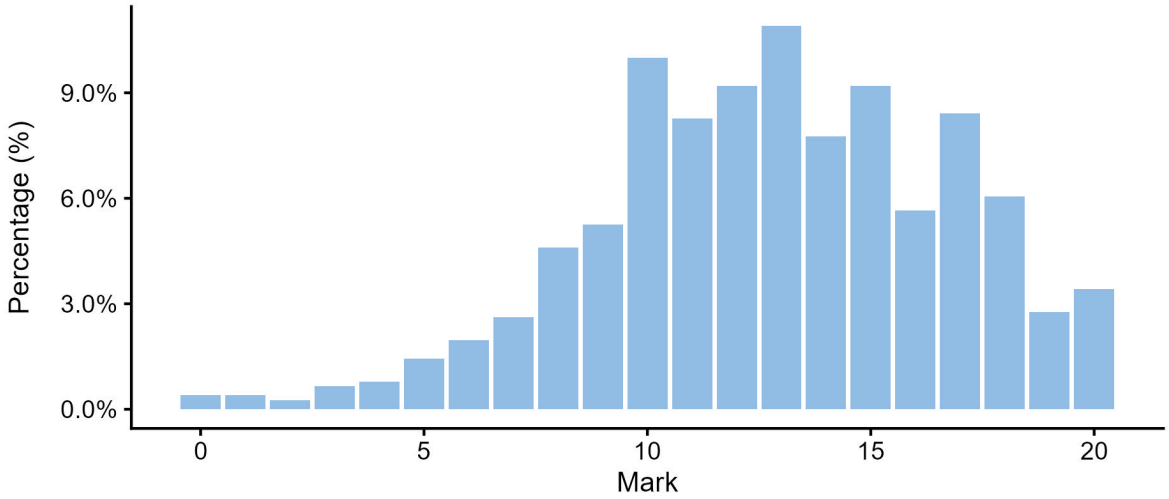
Units 3 and 4 internal assessment (IA) results

Total marks for IA

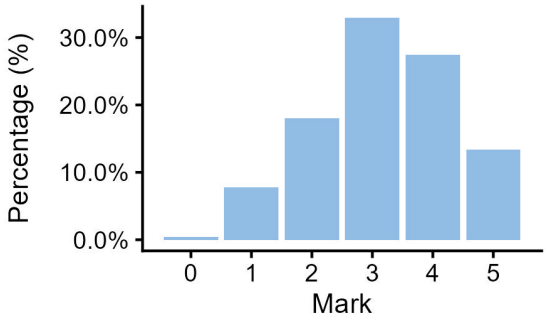


IA1 marks

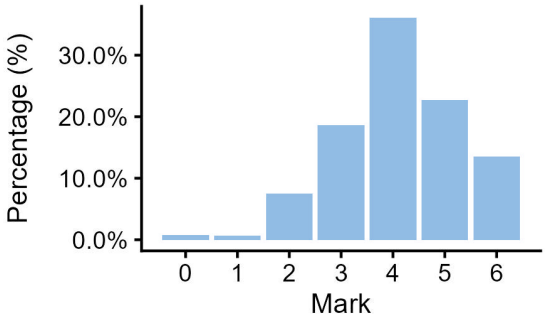
IA1 total



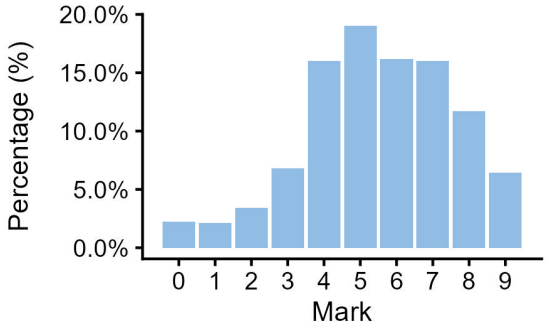
IA1 Criterion: Recognising and explaining



IA1 Criterion: Analysing and determining

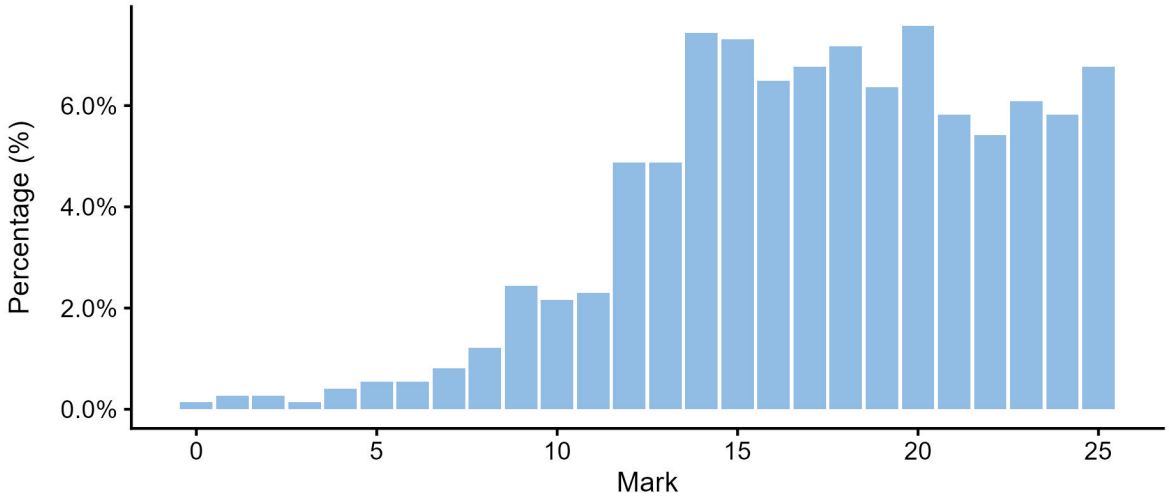


IA1 Criterion: Synthesising and evaluating

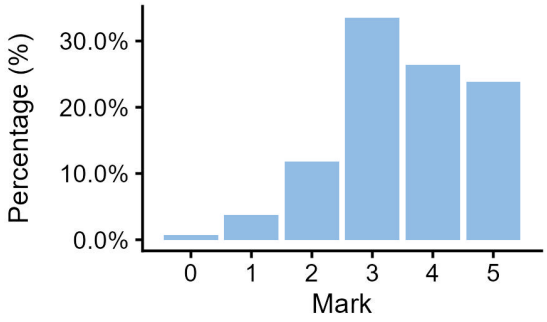


IA2 marks

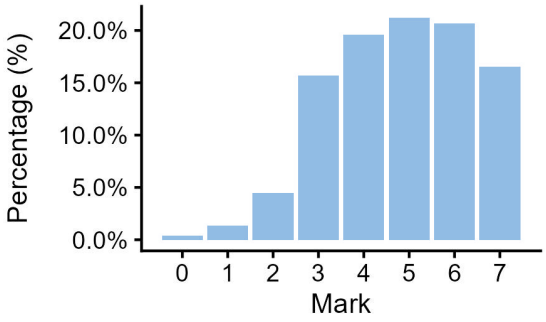
IA2 total



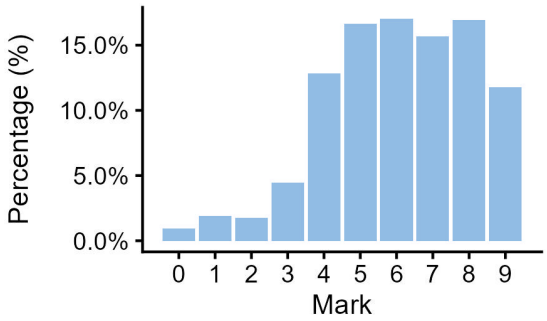
IA2 Criterion: Recognising and explaining



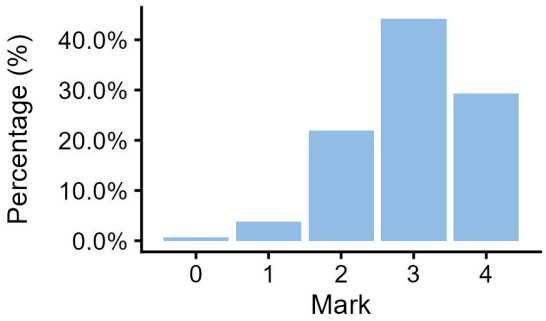
IA2 Criterion: Analysing and determining



IA2 Criterion: Synthesising, generating and evaluating

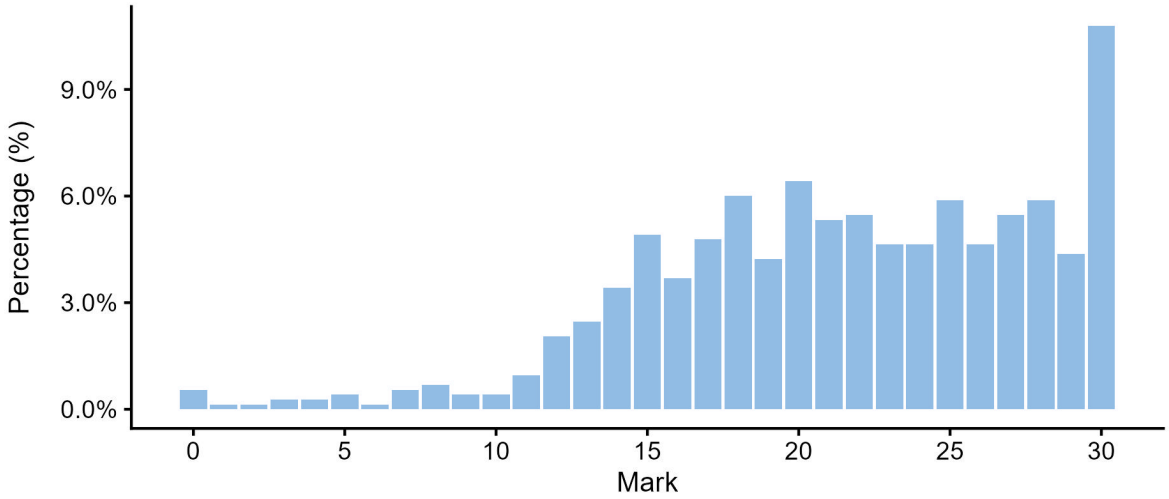


IA2 Criterion: Communicating

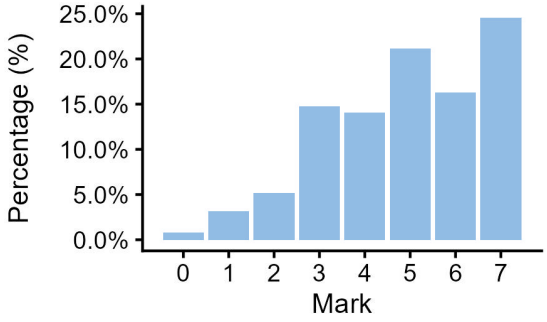


IA3 marks

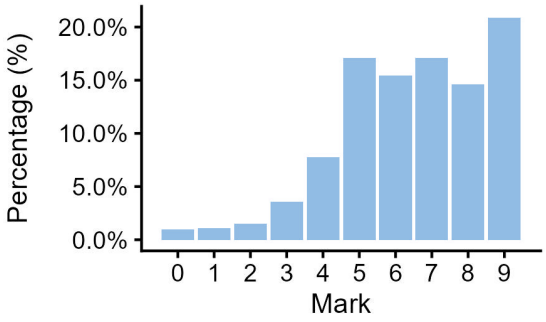
IA3 total



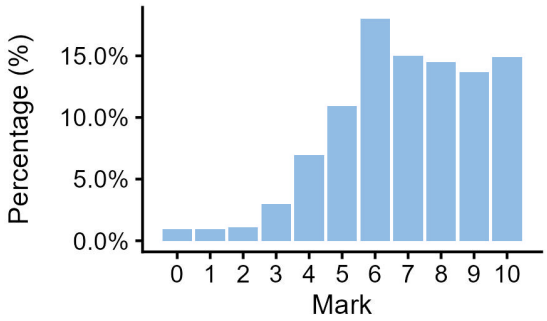
IA3 Criterion: Recognising and explaining



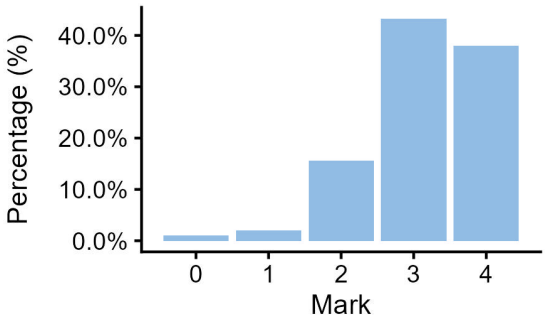
IA3 Criterion: Analysing and determining



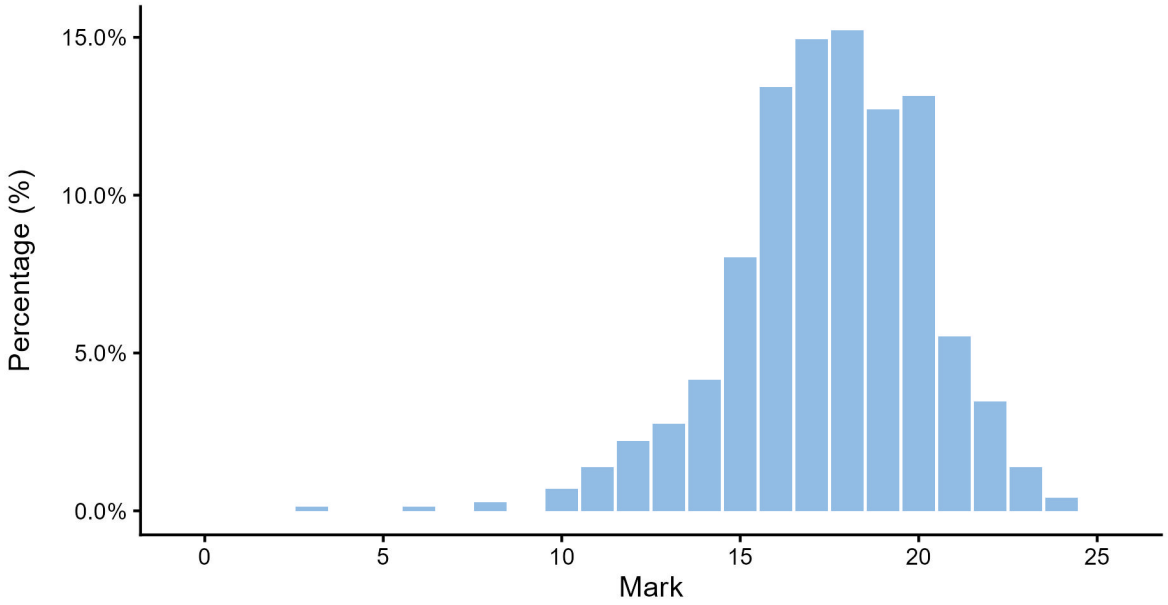
IA3 Criterion: Synthesising, generating and evaluating



IA3 Criterion: Communicating

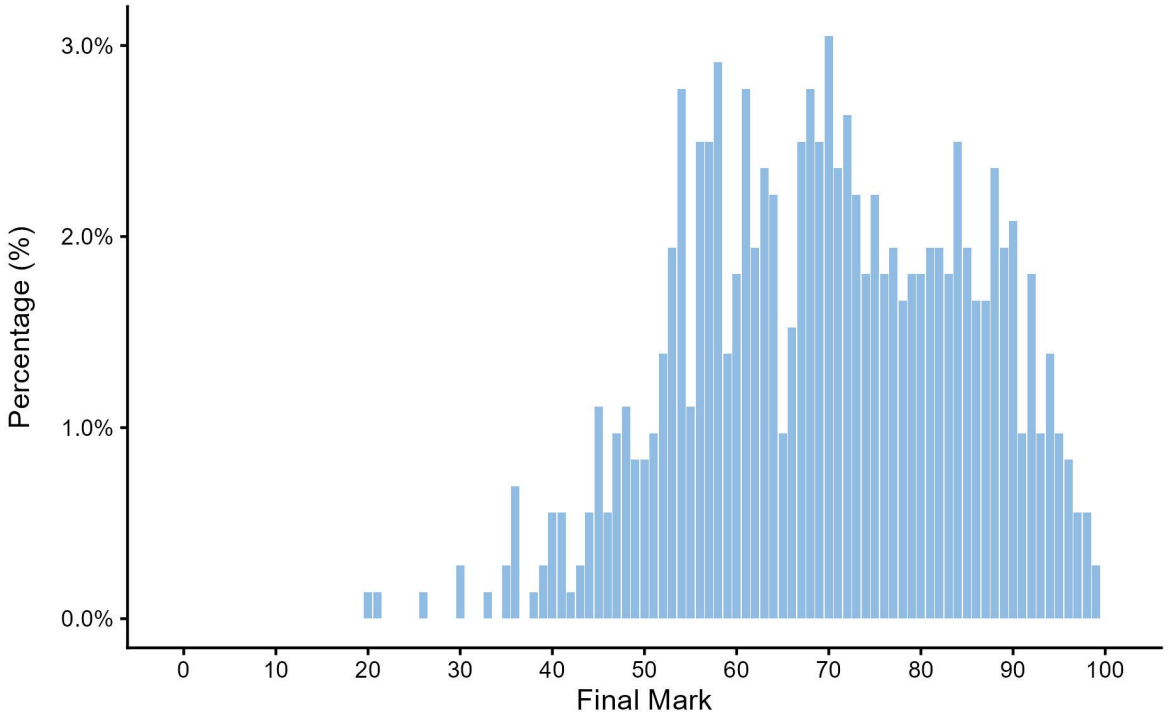


External assessment (EA) marks



Final subject results

Final marks for IA and EA



Grade boundaries

The grade boundaries are determined using a process to compare results on a numeric scale to the reporting standards.

Standard	A	B	C	D	E
Marks achieved	100–83	82–65	64–45	44–19	18–0

Distribution of standards

Number of students who achieved each standard across the state.

Standard	A	B	C	D	E
Number of students	175	270	245	31	0
Percentage of students	24.27	37.45	33.98	4.30	0.00

Internal assessment

This information and advice relate to the assessment design and assessment decisions for each IA in Units 3 and 4. These instruments have undergone quality assurance processes informed by the attributes of quality assessment (validity, accessibility and reliability).

Endorsement

Endorsement is the quality assurance process based on the attributes of validity and accessibility. These attributes are categorised further as priorities for assessment, and each priority can be further broken down into assessment practices.

Data presented in the Assessment design section identifies the reasons why IA instruments were not endorsed at Application 1, by the priority for assessment. An IA may have been identified more than once for a priority for assessment, e.g. it may have demonstrated a misalignment to both the subject matter and the assessment objective/s.

Refer to *QCE and QCIA policy and procedures handbook v7.0*, Section 9.5.

Percentage of instruments endorsed in Application 1

Internal assessment	IA1	IA2	IA3
Number of instruments	70	70	69
Percentage endorsed in Application 1	33	64	55

Confirmation

Confirmation is the quality assurance process based on the attribute of reliability. The QCAA uses provisional criterion marks determined by teachers to identify the samples of student responses that schools are required to submit for confirmation.

Confirmation samples are representative of the school's decisions about the quality of student work in relation to the instrument-specific marking guide (ISMG) and are used to make decisions about the cohort's results.

Refer to *QCE and QCIA policy and procedures handbook v7.0*, Section 9.6.

The following table includes the percentage agreement between the provisional marks and confirmed marks by assessment instrument. The Assessment decisions section for each assessment instrument identifies the agreement trends between provisional and confirmed marks by criterion.

Number of samples reviewed and percentage agreement

IA	Number of schools	Number of samples requested	Number of additional samples requested	Percentage agreement with provisional marks
1	68	444	3	77.94
2	68	441	0	76.47
3	68	441	0	67.65

Internal assessment 1 (IA1)

Examination (20%)

The examination assesses the application of a range of cognitions to provided items — questions, scenarios and problems.

Student responses must be completed independently, under supervised conditions, and in a set timeframe.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions
Alignment	14
Authentication	0
Authenticity	14
Item construction	8
Scope and scale	33

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- allowed students to demonstrate understanding of Unit 3 subject matter, including the chemical, functional and nutritional properties of carbohydrate-based or fat-based food, e.g. explanation of chemical and functional properties of fat in salad dressings, or the hydrogenation process of fat, or the functions of carbohydrate
- clearly cued students on the cognitions and processes required, e.g. describe, explain, analyse, synthesise and evaluate
- enabled students to demonstrate the assessable objectives and meet the upper performance levels of the ISMG in the Recognising and explaining criterion
- enabled authentication of student responses by including unseen stimulus, questions and problems.

Practices to strengthen

It is recommended that assessment instruments:

- allow students to demonstrate upper performance level descriptors of the ISMG in the Analysing and determining criterion by analysing information and data related to the properties and processing of carbohydrate-based or fat-based food, e.g. analysis of formulations and

processing to determine the most appropriate fat for deep frying chips or starch for a gelatinised product

- contain contextualised stimulus materials of suitable scope and scale, including
  - a food industry problem with relevant stakeholder information to enable astute development of self-determined criteria
  - prototype formulations with variations in procedures and components to enable analysis and synthesis of chemical, functional and nutritional properties and processing of carbohydrate-based or fat-based foods. Prototype formulations with limited variation (e.g. changes to only one component or identical processing methods) limit student opportunity to demonstrate analysis, synthesis and evaluation
  - information and data that does not lead to a predetermined response, e.g. sensory profiling and nutritional data
- avoid Unit 4 subject matter, e.g. consumers with type 2 diabetes, vegetarians and health-conscious consumers
- include questions that are sufficiently different from the QCAA sample examination to avoid authentication issues and enable students to produce unique responses
- use food industry contexts and avoid hospitality industry contexts such as cafes, school canteen and childcare settings.

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions
Bias avoidance	0
Language	8
Layout	2
Transparency	5

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- were clearly structured in alignment with syllabus specifications and included visually clear images and graphs
- included appropriate space for responses, including written and graphical responses
- were free from bias, stereotypes and inappropriate content.

Practices to strengthen

It is recommended that assessment instruments:

- use language that is technically correct and aligned with the syllabus, e.g. *formulation* and *components* rather than *menu*, *ingredients* and *recipe*, which are not syllabus terminology

- are closely reviewed to ensure they are error free and can be responded to within the examination time. Stimulus materials (e.g. unrelated consumer trends) that are not required to answer the question should not be included
- use Australian metric units of measurement (e.g. kilojoules, grams and Celsius) in formulations and nutrition information panels.

Additional advice

When developing an assessment instrument for this IA, it is essential to consider the following key differences between the 2019 and 2025 syllabuses:

- Perusal time has been reduced from 10 minutes to 5 minutes. Therefore, stimulus material should be succinct with a clear layout to support accessibility. Schools should continue to create an expected response to ensure that the task is of an appropriate scope and scale and allows students opportunity to meet the upper performance levels of each criterion.
- Objective 3 analysis is now only included in the examination (not included in the IA2 and IA3 solutions); therefore, the short and extended response sections should include sufficient opportunity for students to demonstrate the characteristics in this objective of the ISMG.
- Assessment objective descriptors 4, 5 and 7 now use the term *success criteria* rather than *solution requirements* and *self-determined criteria*. The revised terminology should be used in the examination.

Assessment decisions

Reliability

Reliability refers to the extent to which the results of assessments are consistent, replicable and free from error.

Agreement trends between provisional and confirmed marks

Criterion number	Criterion name	Percentage agreement with provisional	Percentage less than provisional	Percentage greater than provisional	Percentage both less and greater than provisional
1	Recognising and explaining	94.12	5.88	0.00	0.00
2	Analysing and determining	94.12	5.88	0.00	0.00
3	Synthesising and evaluating	80.88	19.12	0.00	0.00

Effective practices

Reliable judgments were made using the ISMG for this IA when:

- for the Recognising and explaining criterion
  - judgments considered whether responses demonstrated accuracy when describing facts and principles about the processing and nutritional, chemical, functional and sensory properties of carbohydrate- or fat-based food, e.g. functions and classifications of fats or carbohydrates, types of leavening agents, oxidation of fats

  - judgments considered whether responses provided discerning explanations of food science ideas and problems, e.g. explanation of the role of emulsifiers in mayonnaise, explanation of stakeholder needs and consumer trends in relation to a problem

- for the Analysing and determining criterion
  - judgments considered whether responses to short response questions showed insightful analysis of sensory profiling information to graphically represent and analyse data related to the properties and processing of carbohydrate- or fat-based foods
  - judgments considered whether responses to short and extended response questions showed insightful analysis of information and data related to the properties and processing of carbohydrate- or fat-based food, e.g. emulsion quality, analysis of processing methods and nutritional and sensory properties to determine the best combination of components and processing for salad dressing.

Practices to strengthen

To further ensure reliable judgments are made using the ISMG for this IA, it is recommended that:

- when matching evidence to the characteristics for the Synthesising and evaluating criterion at the upper performance level, ensure that
  - attention is given to ensuring that synthesis is both coherent and logical and includes relevant chemical, functional and nutritional information and data
  - in the extended response question, all formulations are critically evaluated against each of the self-determined criteria, identifying and justifying one as the solution
  - evaluations include explicit reference to relevant data from the stimulus to support judgments about ideas and the solution
  - recommendations for refinements are specific and justified using sensory profiling data, nutritional data and other relevant information to demonstrate how the solution can be enhanced.

When making judgments for this IA for the 2025 syllabus, it is essential to consider the following key differences between the ISMGs in the 2019 and 2025 syllabuses:

- In the 2025 syllabus
  - the added upper mark performance level for the Recognising and explaining criterion is 6–7 marks with identical characteristics to the 2019 syllabus upper mark performance level (4–5). The 4–5 mark performance level includes the new characteristics of ‘accurate recognition and effective description’ and ‘effective explanation’.
  - the Analysing and determining criterion includes the added upper mark performance level of 7–8, and at the 3–4 mark performance level includes the new characteristics of ‘superficial analysis’ and ‘vague determination’.
  - the Synthesising and evaluating criterion upper mark performance level is 9–10 and the lower mark performance level is 1–2.

Additional advice

It is essential to consider the following key differences between the 2019 and 2025 syllabuses:

- Objectives 1 and 3 are exclusively assessed in the IA1. Therefore, the IA1 must provide sufficient opportunity for students to demonstrate these objectives and achieve the upper mark performance levels of the ISMG.

- Objective 4 requires determination of success criteria rather than self-determined criteria.

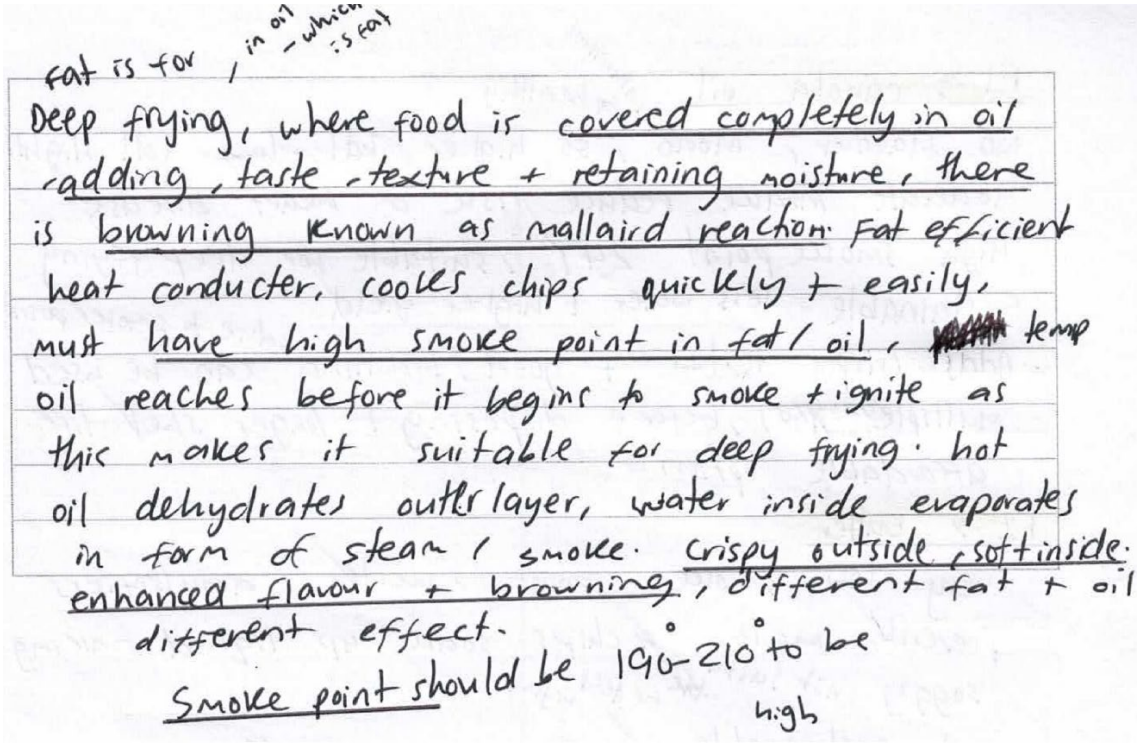
Samples

The following excerpts demonstrate:

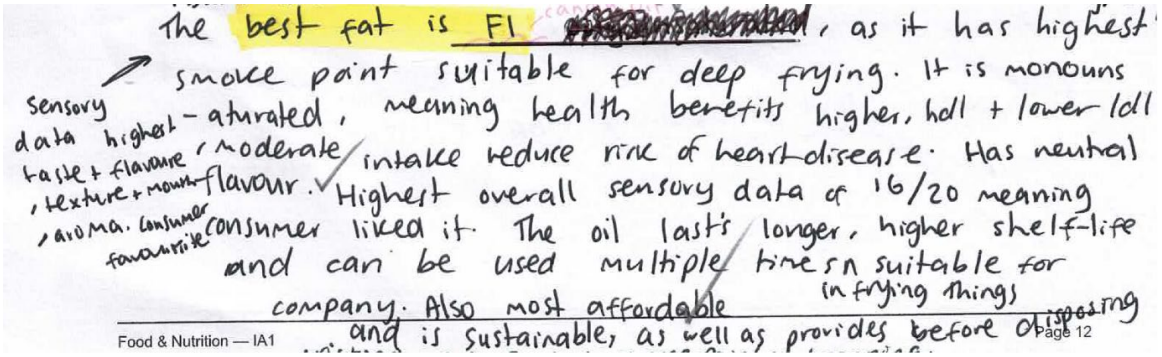
- discerning explanation of the chemical and functional properties of fats when deep frying (Excerpt 1)
- insightful analysis of the chemical, functional and nutritional information and data of fats for deep frying (Excerpt 2)
- astute determination of solution requirements related to emulsions, including quality and functionality indicators (Excerpt 3)
- insightful analysis of mayonnaise formulations (Excerpt 4)
- astute recommendations for refinements against self-determined criteria (Excerpt 5).

Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.

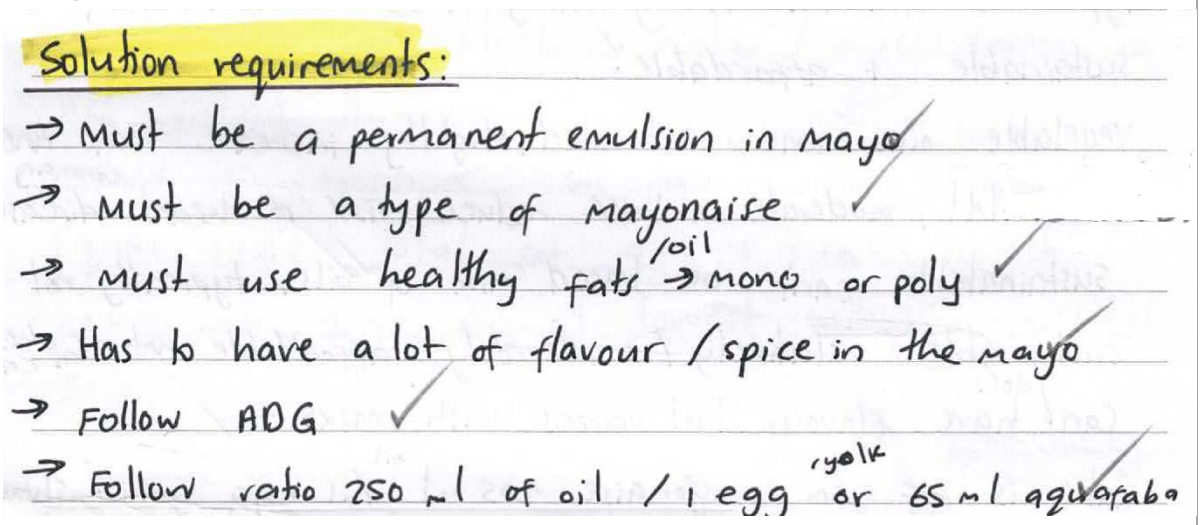
Excerpt 1



Excerpt 2



Excerpt 3



Excerpt 4

PF1: Chipotle Mayonaise

Sunflower oil used, polyunsaturated, higher hdl, lower ldl, moderate intake reduce risk of heart disease and type 2 diabetes. It has a mild flavour and is not sustainable overconsumption of water, soil degradation, uses lots of land and energy excessive use in processing. Lower shelf-life and emulsion won't last as long seperate, quicker than other oils, like canola. Moderately affordable.

Ratio is off 250 ml of sunflower oil to 2 egg yolks → more runny consistency. should be 1egg yolk
Emulsifiers are mustard, holds emulsion together + stable lime juice extends shelf life + stabilisers. smoothening texture, adding pale colour + zesty and tangy flavour.
Egg yolk, contain lethicin allow for emulsion and stabilise.
Method includes oil pouring slowly, it is good.
Total fat 9g equal highest. Sat fat 1g same as other formulations, low, cholesterol 10mg, highest

Excerpt 5

ingredient refining	refinement made/change	why
2 egg yolk	remove 1egg yolk / remove 1	help with appearence not as yellow + texture less runny, fits ratio of 250ml oil / 1 egg yo
Add ingredient	lemon myrtle + lilli pilli	Adds native Australian flavour + local, improve spiceness / taste.
Chilli	Remove seeds	Helps improve texture, won't be seeds, unpleasent for consumer.

sunflower oil	canola oil	More sustainable, longer shelf-life, affordable option, neutral flavour, emulsion will last longer + doesn't seperate as quickly.
Remove ingredient	Remove salt	follow ADG moderate intake of sodium. Not needed with lime juice.

Internal assessment 2 (IA2)

Project — folio (25%)

This assessment focuses on a problem-solving process that requires the application of a range of cognitive, technical and creative skills, and theoretical understandings. Students document the iterative process undertaken to develop a solution to a food-related problem. The response is a coherent work that may include written paragraphs and annotations, diagrams, sketches, drawings, photographs, tables, spreadsheets and a prototype.

This assessment occurs over an extended and defined period of time. Students may use class time and their own time to develop a response to the food and nutrition problem.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions
Alignment	8
Authentication	0
Authenticity	6
Item construction	3
Scope and scale	14

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- allowed students to apply Unit 3 subject matter and the problem-solving process, e.g. for a commercial biscuit company that requires a new carbohydrate-based snack product, or for a chocolate manufacturer that wishes to diversify into other confectionary ranges
- included clear instructions using the complete syllabus specifications for the assessment instrument, e.g. reproduced the specifications from the syllabus, p. 45, *To complete this task you must*
- ensured student authorship by using authentication strategies consistent with QCAA guidelines.

Practices to strengthen

It is recommended that assessment instruments:

- provide an open-ended food industry problem where students can develop a unique response. Contexts or stimuli that require the use of a predetermined component or formulation restrict students' ability to develop authentic responses

- incorporate stimulus material aligned with Unit 3 subject matter, including contextual information about stakeholders, e.g. company ethos and product lines
- use Unit 3 subject matter and syllabus language, e.g. *formulation* and *components* rather than *recipe* and *ingredients*. Genetically modified foods and high-protein diets are not Unit 3 subject matter
- present an authentic carbohydrate-based or fat-based food industry problem, excluding hospitality, school and childcare settings.

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions
Bias avoidance	0
Language	1
Layout	0
Transparency	0

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- used appropriate spelling, grammar, punctuation and other textual features
- provided stimulus with a clear layout, diagrams and images.

Practices to strengthen

There were no significant issues identified for improvement.

Additional advice

When developing an assessment instrument for this IA, it is essential to consider the following key differences between the 2019 and 2025 syllabuses:

- The response requirements have changed. For the 2025 syllabus, response lengths will be up to 10 A4 pages and up to 2000 words. Assessment instruments should be designed so that a response can be developed in approximately 15 hours of class time and within the response requirements.
- Objectives 1 and 3 will no longer be assessed in this instrument. The task specifications should reflect this.

Assessment decisions

Reliability

Reliability refers to the extent to which the results of assessments are consistent, replicable and free from error.

Agreement trends between provisional and confirmed marks

Criterion number	Criterion name	Percentage agreement with provisional	Percentage less than provisional	Percentage greater than provisional	Percentage both less and greater than provisional
1	Recognising and explaining	95.59	4.41	0.00	0.00
2	Analysing and determining	86.76	13.24	0.00	0.00
3	Synthesising, generating and evaluating	77.94	22.06	0.00	0.00
4	Communicating	100.00	0.00	0.00	0.00

Effective practices

Reliable judgments were made using the ISMG for this IA when:

- for the Recognising and explaining criterion, judgments considered whether responses demonstrated discerning explanations and clearly showed how the chemical, functional and sensory properties of food related to the problem for a carbohydrate- or fat-based solution
- for the Analysing and determining criterion, judgments considered whether responses showed insightful analysis that included an understanding of how components, processing, sensory attributes, and chemical and functional properties of food interact to identify key features for prototypes and the solution, e.g. dextrinisation, emulsification
- for the Communicating criterion, judgments considered whether responses demonstrated
  - clear and fluent communication of the iterative phases of the problem-solving process
  - discerning use of visual features such as accurate sensory profiling graphs, prototype images and unbroken tables.

Practices to strengthen

To further ensure reliable judgments are made using the ISMG for this IA, it is recommended that:

- attention is given to providing opportunity for unique and authentic responses, e.g. scaffolded templates are removed
- when matching evidence to the characteristics for the Analysing and determining criterion at the upper performance level, ensure that self-determined criteria are specific and include the relevant impacts and implications of, and quality and functionality indicators for, the problem, e.g. grams of fat per 100 g, serving size, use of an alternative flour range or incorporation of imperfect produce
- when matching evidence to the characteristics for the Synthesising, generating and evaluating criterion, ensure that

- for the Generating objective at the mid to upper performance levels, attention is given to ensuring that a final refined solution has been generated, including valid sensory profiling data
- for the Evaluating objective, appraisals of ideas and the solution are made against each of the self-determined criteria and justified using data
- for the Refining objective, the generated final solution includes purposeful refinements based on data from prototype experimentation. Attention should be given to determining the viability and thoughtfulness of recommendations for refinements
- for the Synthesising objective at the upper performance level, pivotal information and data is drawn together to support selection of prototypes and the solution.

When making judgments for this IA for the 2025 syllabus, it is essential to consider the following key differences between the ISMGs in the 2019 and 2025 syllabuses:

- In the 2025 syllabus, the
  - Recognising and explaining criterion has been reconfigured to Explaining and communicating
  - Analysing and determining criterion has been reconfigured to Determining and generating. Responses require determination of success criteria and generation of ideas and a final solution
  - upper mark range qualifier for the Generating objective has changed from *purposeful* to *proficient*. This requires generation of ideas and a solution that align with the success criteria for the problem
  - Synthesising, generating and evaluating criterion has been reconfigured to Synthesising and evaluating
  - Synthesising objective no longer includes a descriptor for *nutritional information*
  - Communicating objective includes added mark ranges of 4–5 and 6–7.

Samples

The following excerpts demonstrate:

- discerning explanation of a problem related to a carbohydrate-based food solution (Excerpt 1)
- astute determination of self-determined criteria that include quality, functionality and reliability indicators (Excerpt 2)
- logical and coherent synthesis of information and data. It shows the development of ideas in relation to the problem and the self-determined criteria (Excerpt 3)
- purposeful generation of ideas. It includes valid sensory profiling data to determine the feasibility and critical evaluation against self-determined criteria (Excerpt 4)
- purposeful generation of a refined solution, including valid sensory profiling data (Excerpt 5)
- critical evaluation of the solution against each of the self-determined criteria and data. It shows astute recommendations for refinement, justified by data (Excerpt 6).

Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.

Excerpt 1

1. Explore the Food Problem

1.1 Explanation of the Food Problem

1.1.1 Summary of the Food Problem

After the analysis of the context and stimuli, the problem identified is an opportunity to expand [redacted] current home baking convenience product range by developing a high-quality carbohydrate-based baking product. The line extension/new product will need to entice consumers using carbohydrate-based food products and components whilst complying with the company's current ethos.

1.1.2 Stakeholders

Stakeholders are the groups of people could be affected by or affect the formulation of the product. The stakeholders involved in the product include [redacted], the [redacted] company (Stimulus 2), and both companies' current consumers who are represented by the focus group, providing insight and criticism on [redacted] products as shown in the consumer feedback (Stimulus 3).

1.1.3 Needs and opportunities pertaining to the Food System Sectors

[redacted], as stakeholders are attempting to develop a new carbohydrate-based baking product as an extension to their current range. A new prototype must differ to products currently produced to provide variety among their range and entice consumers. However so, the prototype should comply with the [redacted] company's ethos to be successful. Current practices of [redacted] and [redacted] when developing carbohydrate-based baking goods comprises of; better products – providing healthier products to assist consumers make better choices and, a better planet – sustainability of components for a positive effect on the planet (Goodman Fielder, n.d.).

A minimal increase in manufacturing and processing costs for a carbohydrate-based line extension would be incurred. As part of [redacted], who produce and market many components required for carbohydrate-based batters and doughs – such as flour, oil, bakery fats and sugar (Stimulus 2), minimal processing and component costs would be required. If a new product were to be developed to entice consumers, additional costs may be incurred due to differences in processing compared to [redacted] current range.

[redacted] attempts to account for many different consumer markets through their wide range of convenience products. However, their main target-markets include; health-conscious consumers who are concerned about selecting more nutritious and healthy options when baking through [redacted] gluten-free and reduced sugar range ([redacted], 2025), and convenience seekers who value easy-to-use pre-mixed cakes batters to make baking simpler and quicker for consumers who don't have a lot of time on their hands, whilst maintaining high quality components and products. [redacted] must also account for and comply with [redacted] target-market of eco-conscious consumers through the sustainability of components, processing, and packaging ([redacted] n.d.). The target-market consumers are represented by the focus group (Stimulus 3) who are therefore made up of the health-conscious consumer market, the convenience consumer market, and eco-conscious consumers.

The focus group's initial feedback (Stimulus 3) included recommendations for [redacted] such as:

- Increasing savoury range
- Addition of fruit flavours
- Gluten-free range of baking kit products
- Using alternative grains/wholegrains to improve healthiness.

The focus group's feedback for [redacted] product range extension included:

- Muffin-like products (20% request)
- Bread products (30% request)
- Dessert products (25% request)
- 'On the go' products (25% request)

1.1.4 Constraints

The problem's constraints require a prototype solution to:

- Comply with [redacted] current practices (include sustainably sourced components, sustainably package the product).
- Apply and take into consideration the feedback from the Focus group of [redacted] current consumers.
- As a line-extension/new product the prototype should enhance current product range (should provide convenience for consumer markets, high-quality components and products).
- Be a carbohydrate-based product.

Excerpt 2

1.5 Determination of criteria to be used to evaluate the solution

1.5.1 Essential solution requirements	1.5.2 Self-Determined Criteria
Develop a recipe as a line-extension or new product for [redacted], using an alternative flour to entice and appeal to the growing health-conscious and convenience-seeking consumer market.	The carbohydrate-based solution should be: • Has sugar content of less than 15g per 100g to promote health and nutrition. • Aligning with [redacted] company's ethos (Use sustainable and high-quality components). • Use an alternative flour to tradition all-purpose wheat flour for healthier options. • Uses components that have a low glycaemic index.
The prototype must stay somewhat consistent with [redacted] current product range, meaning the prototype should be able to be heated/baked, comply with [redacted] ethos of sustainability, be nutritious/healthy and be easy and quick to bake for convenience seekers.	• Possess a palatable and well-balanced flavour and taste and texture profile. • Visually appealing with an inviting aroma. • Designed to attract positive feedback from the target-market consumers and focus group.
The prototype must be carbohydrate-based and use an alternative flour mentioned in Section 1.2.2 to appeal to health-conscious consumers and the focus group's feedback.	The carbohydrate-based solution could be: • Gluten-free to allow for a wider variety of consumers and fit into the gluten-free category. • Dairy-free to allow for a wider variety of consumers. • Have a relatively low cooking time (less than 30 minutes) and have 4 or less wet components (the consumer is required to purchase and add in) to provide convenience for consumers. • A muffin, 'on-the-go,' bread or dessert product as related to focus group feedback. • Have a savoury or fruit flavour as related to the focus group feedback.

Excerpt 3

2.1 Synthesis of food and nutrition information and data, to develop ideas for alternative solutions

The development of ideas for alternative solutions is supported by the information and data presented in Section 1. The problem, stakeholder needs, constraints, chemical and functional properties of carbohydrates, techniques used to process carbohydrates, and an analysis of [redacted] current product range was synthesised in Section 1.5 to determine the solution requirements and self-determined criteria.

In Section 1.1, the identified problem was the opportunity to develop a carbohydrate-based product as a line extension or new product for [redacted] current product range, with the goal of enticing consumers (context) and satisfying the needs of their target market. Stakeholder needs were identified, including those of [redacted], the parent company [redacted], and their consumers – specifically health-conscious individuals, convenience-seekers, and eco-conscious consumers. These target consumer groups and current consumers, represented by the focus group (Stimulus 3), are relevant due to their relationship with [redacted] and [redacted]. These target consumer groups are existing and future consumers and must be considered during the development of the carbohydrate-based product. Furthermore, it was identified that a line-extension would involve minimal costs, whereas developing a new product could incur additional expenses due to differences in processing requirements. Constraints for the development of the solution were identified to be: compliant with [redacted] current practices (including sustainably sourced components, sustainably package the product), apply and take into consideration the feedback from the focus group of [redacted] current consumers, as a line-extension, the prototype should follow [redacted] current product range (should provide convenience for consumer market, high-quality components, and products), be a carbohydrate-based product and, use alternative grains and flours to improve healthiness.

In Section 1.2, the types of carbohydrates and alternative grains and flours were explored. Section 1.2.1 explained the types of carbohydrates, the glycaemic index (GI) and relevant food sources as background information into a carbohydrate-based solution. It was identified that a low GI in products (which is typically when all-purpose wheat flour isn't used) would entice stakeholders – specifically health-conscious consumers. Section 1.2.2 explored alternate flours to account for healthier and more nutritious baked goods, which relates to the constraints, essential solution requirements and self-determined criteria. The exploration of alternate flours also has the potential to include the gluten-free consumer market in the problem. This provides the opportunity to develop a solution using alternative flours and identifies how these methods would appeal to the relevant stakeholders.

In Section 1.3, the chemical and functional properties of carbohydrates such as - dextrinisation, gelatinisation, leavening, caramelisation, crystallisation, and nucleation – were explored. The understanding and identification of these chemical reactions and their relevance to both the problem and proposed solution is essential when processing carbohydrate-based products. Additionally, a range of carbohydrate processing techniques and their relation to the problem were considered, including dehydration, additives, the change of pH through acids and alkalis, physical manipulation, heat processing and cold processing.

In Section 1.4, [redacted] current product range were explored across three chosen categories - Gluten-Free, Quick and Easy and Cupcakes & Muffins. Sweet and savoury products from each product line were explored to generate ideas and expectations for the prototypes and solutions. Furthermore, the chemical and functional properties of the carbohydrates in the products were also identified during the research of recipes for each product to better understand how [redacted] currently process and produce their carbohydrate-based products.

Excerpt 4

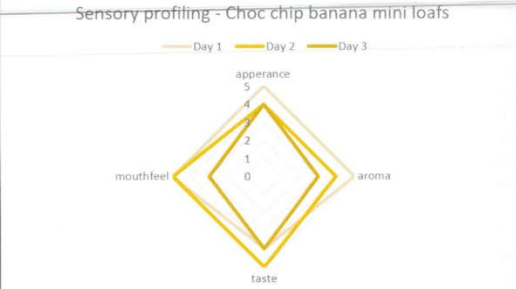
2.3. Primary experimental data of alternative solutions

Formulation 1:

Data from sensory profiling

Formulation 1	Day 1	Day 2	Day 3
Appearance	Light, round, fluffy shiny **(5)**	Light, round, shiny, fluffy **(4)**	Shiny, round **(4)**
Aroma	Vanilla, sweet, strong **(5)**	Vanilla **(4)**	Weak vanilla **(3)**
Taste	Flavourful, Fruity, Vanilla **(4)**	Fruity, vanilla **(5)**	Vanilla **(4)**
Texture	Soft, light, airy **(5)**	Soft **(5)**	Dense, smooth **(3)**

Sensory profiling graph



5-point scale
1= poor
2= fair
3= okay
4= great
5= excellent

Picture

Nutritional analysis (100g)

Choc Chip Banana Mini Loafs

NUTRITION INFORMATION
Servings per package: 10
Serving size: 116g

	Average Quantity per Serving	Average Quantity per 100g
Energy	1530kJ (365Cal)	1310kJ (314Cal)
Protein	5.4g	4.6g
Fat, Total	14.7g	12.7g
- Saturated	2.7g	2.3g
Carbohydrate	53.4g	45.8g
- Sugars	31.g	27.4g
Sodium	223mg	191mg

Fat	12.657 g
Sat.Fat	2.279 g
Poly.Fat	2.920 g
Mono.Fat	6.775 g

Conclusion:

Summarising the data from the sensory evaluation, it is clear that the Choc Chip Banana Mini Loafs scored exceptionally high in all categories with a rating of 5 (excellent) in the appearance, aroma, and texture and a 4 (Great) for taste. Comments from the evaluators revealed its light and shiny appearance, sweet vanilla scent, fruity taste, and its soft and airy texture. On day 2, the sensory properties of the product had mostly no change, apart from the weakened aroma. On day 3, the texture of the loaf became slightly dense, however its appearance maintained shiny and fluffy (4), along with its vanilla taste which was rated a 4, indicating a suitable shelf life which meets the necessary criteria. The use of canola oil benefitted both the sensory and nutritional aspects of the product. According to the nutritional label, the loaf contains 12.657g of total fat per serving, of which 2.279g is saturated fat, 2.920g is polyunsaturated fat, and 6.775g is monosaturated fat. Compared to butter-based baked goods, this fat profile is healthier due to the low saturated fat content and the presence of monosaturated fats, which are linked to cardiovascular health, thus connecting to the [redacted] goal of reducing unhealthy fats and the consumer preferences for low saturated fat. The polyunsaturated fats also contribute essential fatty acids, further improving the nutritional profile. Functionally, the canola oil helped to maintain the loaf's soft texture and contributed to its light, airy crumb even as it sat for 3 days. Moreover, the oil worked effectively in the products moisture retention, assisting to keep it moist and not dry out over time, advancing its shelf life. Cost-wise, the substitute of canola oil is a beneficial option at $3.80, making it viable for large-scale production. As a modern take on banana bread, this formulation works well as an extension to the [redacted], utilising traditional baking techniques like the one-bowl method, ensuring ease of production while maintaining high sensory appeal. The product also aligns with the [redacted] sustainability goals as it is preservative-free and relies on natural moisture retention from the banana and oil. Given its day 3 shelf life, this formulation is a promising butter-free alternative that is cost-effective, maintains a high sensory appeal, and offers nutritional benefits.

Excerpt 5

3.1 Synthesis of primary experimental data to generate proposed solution

As previously determined in Section 2.3.1, further experimentation is required to refine the selected prototype. A key area for improvement is the visual appearance of the breakfast bars. Suggested refinements include adding a white chocolate or pistachio drizzle (used in moderation to maintain nutritional balance), which would enhance both appearance and flavour. It has been identified that [redacted] will need to invest in a rectangle bar cutter (as this differs to current product processing), to ensure neat and uniform portions that improve presentation of the bars. To better appeal to health-conscious consumers, the glycaemic index and sugar content per 100g, needs to be reduced. Proposed refinements include replacing dried fruits with fresh blueberries, raspberries and ¼ cup unsweetened apple sauce, and replacing the honey with 1 tsp of raw honey and ½ tsp monk fruit granules. Additionally, steel-cut oats will be used in place of rolled oats for their lower glycaemic impact. These refinements aim to enhance the prototype's sensory properties and ensure it meets more self-determined criteria, making it a feasible and marketable solution for [redacted]. The modifications are designed to align with [redacted] ethos and complement [redacted] existing product range. It has been identified that there is potential for [redacted] to enter the pre-made bakery market. Therefore, this prototype will be trialled as a prebaked bar which will be individually wrapped and sold in boxes of 6.

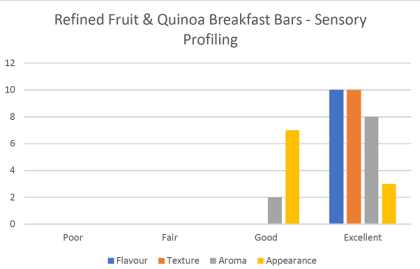
Refined Formulation for Fruit and Quinoa Breakfast Bars

Components	Processing
Dry components: - ½ cup organic quinoa - ½ cup steel-cut oats - ½ cup almond flour - ¼ cup chia seeds - ½ tsp cinnamon - ¼ tsp salt - ¼ tsp baking powder - ¼ cup almonds - ½ cup fresh blueberries and raspberries (fructose) - ¼ cup unsweetened apple sauce - 1tbsp sugar-free white chocolate chips (glucose) - 1tsp monk fruit sugar replacement Wet components: - 1 tsp raw honey (fructose + glucose) - ¼ cup almond milk - 1 large egg - 1 tsp vanilla extract (no added sweeteners) *Note: Breakfast bars will be premade and packaged in paper to promote sustainability ([redacted] company ethos) *	1. Preheat oven to 180 degrees C. Line a baking dish and grease lightly. 2. Rinse quinoa and cook 2:1 water-quinoa ratio for approx. 15 mins or until water is absorbed. 3. In large bowl combine steel-cut oats, almond flour, chia seeds, cinnamon, salt and baking soda, and sugar replacement, stirring well (physical manipulation). 4. Add cooked quinoa. 5. Sir in berries, nuts and applesauce 6. In separate bowl whisk together honey, almond milk, egg, and vanilla extract until smooth. 7. Add wet components to dry components. Mixture should be thick. 8. Spread mixture evenly into prepared baking dish, ensure an even surface. 9. Bake (heat processing) for 20-25 minutes until bars are golden brown. 10. Melt (heat processing) white chocolate chips in microwave in intervals of 15-20 sec stirring each time until melted. Drizzle lightly over the top of the bar once cooled.
Nutritional Information:	Per 100g: (FSANZ, n.d.): Carbs: 18.1g Sugar: 8.7g GI: Low

discerning refinement

3.2 Food experimentation – Sensory profiling of proposed solution

Data from Sensory profiling



Conclusions: After the refinements, 100% of sensory profilers rated the texture as excellent, highlighting the "the moist texture, combined with crunchy almonds." Flavour ratings also reached 100% excellence with all profilers viewing the refined prototype as excellent noting, "The blueberries + chocolate provide a sweeter taste." Aroma ratings decreased to only 80% excellence attributed to a reduction in raw honey, causing the notable "honey smell," to also decrease. However, the criteria of an 'inviting aroma' was still met. The appearance of the product improved drastically with now 70% of sensory profilers rating good and 30% as excellent. Feedback noted, "White chocolate and berries add more colour," though some mentioned the bars "look a little messy." It is recommended that White Wings invest in a rectangular cutter or mini bar baking tin to ensure uniform, neatly cut proportions.

Following a review of the sensory profiler feedback, the breakfast bars meet the self-determined of attracting positive feedback, with a well-balanced flavour and texture profile and an inviting aroma. Whilst the bars received relatively highly ratings for appearance, [redacted] positions itself as a producer of the "finest quality products" (context). As such, a rating of 'good' in appearance is insufficient to meet the standard of visual appeal, and therefore, the criterion has not been met.

The refined prototype meets all essential solution criteria. Additionally, several self-determined criteria have been satisfied: it uses an alternative flour (almond flour), aligns with [redacted] ethos through the inclusion of components like organic quinoa (supporting sustainability and high quality), is gluten-free, and requires no preparation or cooking making it an ideal 'on-the-go' option for convenience-seekers. It also incorporates both fruit components (blueberries and raspberries) and savoury elements (quinoa), aligning with the focus group's feedback. Nutritionally, the prototype has been refined to reduce the glycaemic index (GI) – achieved by using lower GI foods such as fresh berries to replace dried fruits, reducing and switching to raw honey and substituting rolled oats with steel-cut oats. This satisfies the criterion to use components with a low GI. Moreover, the sugar content has been lowered to 8.7g per 100g, meeting the requirement of less than 15g per 100g of sugar, thereby supporting the development of a healthy and nutritious product.
Currently, the product does not meet the 'dairy-free' criterion due to the inclusion of white chocolate chips. However, this can be addressed in futures refinements by using dairy-free alternatives such as those made with coconut oil or rice milk.

Overall, the refined prototype presents a suitable and effective solution to the identified problem. Only minimal further refinements are required, primarily to enhance the visual appeal of the product and broaden its suitability for dairy-free consumers, thereby increasing overall sensory appeal and market reach.

Excerpt 6

Evaluation and Refinements of ideas and the solution, using self determined criteria and generated data to recommend and justify ideas and the solution to the carbohydrate problem

Evaluation and Refinements Using Self Determined Criteria

The engineered prototypes: Mango skin crisps has been selected as the carbohydrate based snack food solution as it meets the criteria

Evaluation Using Self Determined Criteria	Recommendations for enhancements
The product should remain visually and texturally stable for several weeks to months under appropriate conditions. The mango skin crisps showed visual and textural stability when stored in airtight conditions for up to 10 days, though longer term shelf life was not evaluated. Sensory profiling showed 70% of participants rated texture as good or excellent, suggesting adequate short term crispness. However, the structure softened after a week in ambient humidity, indicating that moisture migration remains a concern for long term stability due to the increased chance of microbial growth (doi, 2016)	Extend shelf life testing over several weeks under variable conditions. Consider applying a light coating of natural preservatives (e.g. rosemary extract or citric acid) to inhibit moisture absorption (doi, 2024). Test alternative packaging such as vacuum sealing or desiccant sachets to maintain crispness.
Flavour and texture must be enhanced through chemical changes such as caramelisation or Maillard browning. The crisps slightly charred edges produced a mild Maillard reaction that enhanced both colour and flavour, with 60% of participants rating the appearance as good or excellent. However, only 40% found the flavour to be excellent, suggesting the burnt edges were either appreciated for complexity or found slightly bitter.	Increase surface browning by pre-drying at a slightly higher temperature to promote more uniform Maillard reactions. Consider brushing mango skins with honey or a glucose-based syrup prior to baking to increase sugar content for deeper caramelisation (doi, 2022). Conduct A/B testing on crisp batches with and without sweetener brushing to assess flavour impact (vwo, 2024). Store in air tight bags filled with nitrogen to help keep the chips fresh and prevent them from becoming stale
Functional properties like water binding, retrogradation, or gelation must improve texture and preservation. Low water activity was effectively achieved through thin slicing and even baking, reducing spoilage risk. However, sensory feedback (30% rating texture only fair) indicated that some crisps were too tough or inconsistently crunchy, likely due to variability in thickness or oven hotspots.	Use a mandoline slicer for uniform thickness and test staggered drying temperatures to avoid over hardening (thespruceeats, 2022). Track internal moisture levels before and after baking to correlate texture results with water binding efficiency. Trial pretreatments (e.g. acid dipping in citric or vinegar) to weaken pectin structure and improve texture (doi, 2017).
Vitamins, fibre, and natural sugars should be preserved through gentle processing. The crisps retained natural mango fibre and sugar without artificial preservatives. However, due to the baking temperatures used, there may be some degradation of heat sensitive vitamins like vitamin C (doi, 2017). No nutritional lab testing was performed, so exact values remain unknown.	Conduct proximate nutritional analysis to confirm retention of vitamin and fibre content. If vitamin loss is confirmed, consider lower drying temperatures or pre-treating with ascorbic acid (doi, 2023). Use marketing to highlight retained fibre content, which aligns with health focused stakeholder goals.
50% of ingredients must be repurposed from surplus or cosmetically imperfect produce. This criterion was fully achieved, as 100% of the crisps were made from discarded mango skins. Stakeholder feedback from [redacted] confirms this aligns directly with their sustainability mission and food waste reduction initiative.	Maintain use of mango skins but document sourcing frequency, spoilage rates, and visual grades used. Establish quality grading criteria to standardise raw inputs for consistent final product quality.
The process must work within current equipment limitations and require no major technological upgrades. All production was completed with standard baking trays and domestic convection ovens. No specialist equipment was required, meeting budget and scaling needs. Sensory results show high feasibility for small batch commercialisation.	No equipment upgrades necessary. For increased batch scale or retail expansion, assess availability of convection dehydrators to improve uniformity and reduce energy costs. Continue refining oven baking protocols for broader scalability.

Internal assessment 3 (IA3)

Project — folio (30%)

This assessment focuses on a problem-solving process that requires the application of a range of cognitive, technical and creative skills and theoretical understandings. Students document the iterative process undertaken to develop a solution to a food and nutrition problem. The response is a coherent work that may include written paragraphs and annotations, diagrams, sketches, drawings, photographs, tables, spreadsheets and a prototype.

This assessment occurs over an extended and defined period of time. Students may use class time and their own time to develop a response.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions
Alignment	15
Authentication	0
Authenticity	17
Item construction	11
Scope and scale	15

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- provided an authentic food industry context to facilitate students' identification of a food problem related to a selected Nutrition Consumer Market (NCM), e.g. a manufacturer of frozen food products needing to reformulate an existing range or add a new product to meet the needs of an NCM
- included stimulus materials that aligned with each of the NCMs provided in the context, e.g. infant, allergic or food intolerant, and elderly.

Practices to strengthen

It is recommended that assessment instruments:

- provide a problem related to the food industry rather than a hospitality, school or childcare context
- include stimulus of appropriate scope and scale (e.g. contextual information about stakeholder needs) to enable students to respond within the response length requirements

- include a selection of Unit 4 NCMs, noting that chronic obstructive pulmonary disease, egg allergy and gluten-free are not Unit 4 NCMs.

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions
Bias avoidance	0
Language	2
Layout	0
Transparency	0

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- included clearly presented tasks with appropriate cues that informed students what they had to do to complete the assessment task.

Practices to strengthen

It is recommended that assessment instruments:

- use syllabus language and terminology for NCMs, e.g. *consumers experiencing diet-related conditions or chronic disease* rather than *coeliac*.

Additional advice

When developing an assessment instrument for this IA, it is essential to consider the following key differences between the 2019 and 2025 syllabuses:

- The response requirements have changed. For the 2025 syllabus, response lengths will be up to 10 A4 pages and up to 2000 words. Tasks should be designed so students can develop a response in approximately 15 hours of class time and within the response requirements.
- Objectives 1 and 3 will no longer be assessed in this instrument. The task specifications should reflect this.
- The Unit 4 NCM options have been revised. Associated stimulus material in the assessment instrument should include a choice of the revised NCMs.

Assessment decisions

Reliability

Reliability refers to the extent to which the results of assessments are consistent, replicable and free from error.

Agreement trends between provisional and confirmed marks

Criterion number	Criterion name	Percentage agreement with provisional	Percentage less than provisional	Percentage greater than provisional	Percentage both less and greater than provisional
1	Recognising and explaining	91.18	7.35	1.47	0.00
2	Analysing and determining	83.82	16.18	0.00	0.00
3	Synthesising, generating and evaluating	77.94	20.59	1.47	1.47
4	Communicating	97.06	0.00	2.94	0.00

Effective practices

Reliable judgments were made using the ISMG for this IA when:

- for the Recognising and explaining criterion
  - judgments considered whether responses provided discerning explanations of a problem related to a selected NCM, e.g. the needs and constraints of a food company developing a line extension snack food suitable for the obese nutrition consumer market (NCM)
  - judgments considered whether responses showed discerning explanation of food science ideas related to the identified NCM problem, e.g. leavening and dextrinisation involved in the production of pizza bases
- for the Analysing and determining criterion
  - judgments considered whether responses analysed relevant nutritional information and data to show an insightful understanding of the relationship to the selected NCM problem, e.g. analysis of pizza base components and Nutrition Information Panels to determine suitability for the NCM and requirements for a nutritionally suitable line extension
  - judgments considered whether responses showed insightful analysis of information and data about formulations and food processing in relation to NCM requirements and constraints, to inform the development of self-determined criteria
- for the Communicating criterion
  - judgments considered whether showed coherent use of language structures, technical terminology and visual features to document the problem-solving process.

Practices to strengthen

To further ensure reliable judgments are made using the ISMG for this IA, it is recommended that:

- when matching evidence to characteristics for the Synthesising, generating and evaluating criterion at the mid to upper performance levels, attention is given to ensuring that a refined solution has been generated, including valid sensory profiling and nutritional data
- when matching evidence to the characteristics for the Analysing and determining criterion at the upper performance level, ensure that the self-determined criteria include specific indicators related to the chosen NCM and can be used to critically evaluate ideas and the solution, e.g. the product must be low in sugar (15 g or less per 100 g), be suitable for lacto-ovo vegetarians (include no animal meat products)
- when matching evidence to the characteristics for the Synthesising, generating and evaluating criterion, ensure that
  - at the upper performance level, purposeful generation of prototypes and the solution directly aligns with the self-determined criteria and the problem
  - the final solution is generated and demonstrates the application of refinements based on data analysis from prototype experimentation. Refinements should align with the problem and the self-determined criteria
  - pertinent information and data related to the NCM problem is synthesised to support selected prototypes and the solution
  - ideas and the solution are evaluated against each of the self-determined criteria and justified using data, e.g. nutritional data and sensory profiling data.

When making judgments for this IA for the 2025 syllabus, it is essential to consider the following key differences between the ISMGs in the 2019 and 2025 syllabuses:

- In each criterion, all changes noted for IA2 also apply to IA3. Note that the synthesising objective includes *nutritional information.*

Samples

The following excerpts demonstrate:

- discerning explanation of the problem in relation to the stakeholders, including the selected NCM (Excerpt 1)
- astute determination of solution requirements and self-determined criteria that can be used to critically evaluate ideas and the solution (Excerpt 2)
- coherent and logical synthesis of information and data to support the choice of prototypes for experimentation (Excerpt 3)
- purposeful generation of a prototype that aligns with self-determined criteria, and critical evaluation of data (Excerpt 4)
- astute recommendations for refinements, justified by nutritional and sensory profiling data (Excerpt 5)

Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.

Excerpt 1

Explanation of the problem

The modern world is a fast-paced environment, with snack foods playing a pivotal role in a person's diet by providing a quick and easy source of energy, sustaining the consumer until their next meal. A snack is a small portion of food or drink or a light meal, especially one eaten between regular meals (Dictionary.com, 2016). Snacks can be in the form of packaged snack foods, other processed foods, or items made from fresh ingredients at home. According to (Priestley's Gourmet Delights, 2025) recent trends have found 99% of consumers have snacked in the past two weeks, with Gen Z and Millennials being the most frequent snackers, often replacing meals with snacks. This information sheds insight into how snacks are a growing sector, making up a significant section of a regular consumer's diet. Popular snack food brands can be seen in the stimulus, such as [redacted] and [redacted] to name a few. These brands, along with many others, produce snack products such as soft drinks, chips, biscuits and noodles. Analysing these snack foods, which are often consumed in Australian households daily, it can be identified that they are very often high in sugar, fat, sodium and energy. These amounts often exceed the recommendations from the Eat for Health Government website (Eat For Health, 2013), which recommends that foods should be within these levels:

- Energy: Less than 600kJ per serve
- Total fat: less than 10g per 100g
- Saturated fat: less than 3g per 100g
- Sugar: less than 15g per 100g is ideal, also check that sugar or alternative names are not listed high on the ingredient list
- Fibre: 3g or more per 100g
- Sodium: less than 400mg per 100g is good, and less than 120mg per 100g is best

[redacted] has been identified as a food product company that primarily provides frozen snack food items. Upon analysing [redacted] products with regard to the above information, their products can be seen to exceed many of the recommended nutritional limits, including fat and energy, across numerous snack food products such as their pizza range. It is important to note that the majority of carbohydrates within these products are highly processed carbs, including bleached wheat flour which is high in GI and would result in a quick release of energy. These high GI carbs lead to energetic feelings for a short period of time before plummeting and are therefore not suitable for obese consumers, who require low gi products, higher in protein (to increase saitety) and lower in energy and fat. Consumption of these snack food products on a regular basis could lead to serious health conditions such as obesity due to the high content of processed carbs, fat and energy. Obesity is a prevalent health problem in Australia. In 2022, according to the Australian Institute of Health and Welfare, 66% of adults aged 18 and over had obesity or were overweight (Australian Institute of Health and Welfare, 2024).

Upon consideration of the information presented above, as well as the stimulus, task and context, it can be determined that the snack foods commonly found in Australian supermarkets are not providing options for certain nutritional consumer markets, especially obesity, a diet-related condition. One of the snack food brands that has been identified as explained above is [redacted], whose products were found to be commonly high in fat and energy (kjs), whilst low in protein and fibre. Evidently, deriving the problem as to develop a reformulation of one of their current snack food products as a line extension for [redacted] providing reduced-fat and energy snack alternatives, such as pizza slices. These products will cater for obese consumers. The process of production and solving the problem will be documented throughout this folio.

Excerpt 2

Determination of solution requirements and self-determined criteria for the solution

Solution Requirements	Self-Determined Criteria
The solution requirements, listed below, were drawn from the stakeholders' needs, task sheet, constraints regarding the problem and the terms and techniques of food science relevant to the problem, explained above: -Produce a snack food product for [redacted] that is a reformulation of one of their products from their current product line, catering for the specific NCM of Obesity -The products must meet the nutritional requirements for obese consumers including low GI, high fibre, high protein, low fat (total and saturated), low kJ´s, low sodium and low sugar -The chosen cooking methods to produce the product must utilise minimal added fats, avoiding deep-frying and shallow-frying -Must be well received by the consumers, represented by the sensory profilers who will provide sensory feedback data regarding the prototypes. The data shall be evaluated and considered to produce the final solution. -The products must align with the values and ethos of [redacted] -The production of the products must take minimal time, effort and equipment to produce -The product must utilise the chemical and functional properties of fats, proteins and carbohydrates relevant to the problem, such as physical manipulation, addition of additives, application of heat, leavening, gelatinisation, Maillard reaction, aeration, denaturation and dextrinisation	The self-determined criteria will be utilised to evaluate proposed ideas and prototypes. The criteria are formulated from the solution requirements: -Is a reformulation of a [redacted] current snack food product, catering for obese consumers -The prototype is well received by the sensory profilers across all sensory properties, including texture, aroma, taste and appearance -Aligns with [redacted] values and ethos by utilising environmentally friendly ingredients to produce quality tasting food -The production of the products must take minimal time, effort and equipment to produce, making it more convenient -Contain minimal ingredients that are highly processed -The product must utilise the chemical and functional properties of fats, proteins and carbohydrates relevant to the problem, such as physical manipulation, addition of additives, application of heat, leavening, gelatinisation, Maillard reaction, denaturation, aeration and dextrinisation -To cater to the nutritional requirements of the consumer with obesity, the product must contain: • Utilise a Low GI source for the carbohydrate component of the dough • Low total (10g) and saturated (3g) fat • Low sugar (15g or less per 100g) • Use low-fat cheese as a substitute to regular cheese • High in protein (10g per 100g is good, 15g per 100g is best) • Acceptable level of energy for a snack (600kJ or less) • High in fibre (3g or more per 100g) • Sodium (less than 400mg per 100g is good, less than 120mg per 100g is best)

Excerpt 3

2.2 Synthesis of secondary information and primary data to develop ideas

[redacted] 2025 Sustainability Plan (Stimulus 1) demonstrates a strong focus on offering healthier, responsible sourced, and environmentally conscious products. This aligns with recent consumer feedback, where 39% of focus group respondents expressed a need for more variety in the ready-to-eat range. Specifically, they requested options that are higher in vegetables, free from additives and preservatives, and lower in salt, sugar, and saturated fat. These preferences were reflected in 2.1 – Survey results, with 60% of respondents stating that nutritional information was extremely important when choosing ready-made meals. Additionally, 70% of participants said they actively avoid added sugar, high sodium, and saturated fat. The survey explored which sensory properties were most important to consumers. The results showed that flavour ranked highest, followed by appearance, with mouthfeel and aroma ranking equally after that. This highlights that any new ready-made meal developed must prioritise strong flavour and visual appeal to attract and satisfy customers. Survey question 4 asked whether [redacted] currently caters well to health-conscious consumers seeking ready-made meals. Only 1 out of 10 respondents answered "yes", while 5 said "no" and 4 said "somewhat". This reveals a significant gap in the current range offered at [redacted] and in the market which confirms the need for new product development focused on nutrition, freshness, sensory properties, with no additives. To meet consumer needs while aligning with [redacted] goals, three possible formulations were developed: Mediterranean style quinoa salad, chicken pesto pasta, and chicken & vegetable stir-fry with brown rice. Each option focuses on nutrition, freshness, and locally sourced and clean ingredients. Given that these meals are designed for short-term consumption, it is important to consider how factors like storage, and oxidation affect quality. Oxidation can lead to changes in taste, texture, and nutrition, especially in products containing grains and vegetables, which may reduce consumer satisfaction. Incorporating naturally acidic ingredients, such as lemon juice in the quinoa salad, helps slow this process without relying on any artificial preservatives. Secondary data indicates that more recently "consumers are becoming more aware of the impact of their food choices on their overall health and are actively seeking out products that align with their values and beliefs. This includes a preference for natural, nutrient-dense foods that are free from artificial additives and preservatives (Daniels, 2023). Aligning with [redacted] and the Australian Institute of Health and Welfare's goal to add a health-conscious ready-made meal to the current range, secondary information reveals that "the ready-made meal industry is quickly adapting to changing consumer demands. In 2025, innovation, sustainability, and health-conscious choices will dominate the market" (FHA, 2025). It is evident that health-conscious ready-to-eat meals are gaining popularity in the current market as consumers are increasingly prioritising nutrition. This shift has led to a growing demand for high-protein, low sugar, low saturated fat, and high dietary fibre options tailored to specific dietary preferences. The Mediterranean quinoa salad is highly suitable as it meets the stimulus goals of increasing vegetable content and reducing artificial additives. It aligns with survey data where 50% of respondents felt [redacted] did not currently meet the needs of health-conscious consumers and supports the 60% from question 1 who consider nutritional information extremely important. The chicken pesto pasta incorporates locally sourced ingredients and helps [redacted] meet their sustainability goal of providing healthier product choices. Is suitable for health-conscious consumers looking for a balanced diet with the inclusion of wholegrains. The chicken stir-fry is highly suitable as it introduces a balanced meal with whole grains and variety of vegetables, directly responding to stimulus feedback. It also appeals to consumers focused on healthier options, which was a common concern in both the stimulus and the 50% of survey respondents who said [redacted] does not cater well to health-conscious customers. Therefore, these meals will be tested to determine their suitability for the nutrition consumer market based on the information above.

Excerpt 4

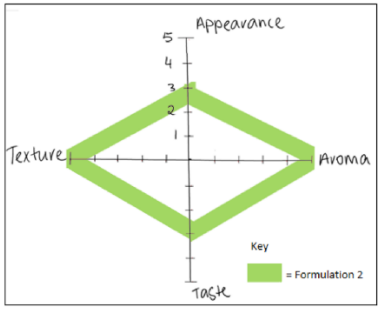
Formulation 2: Chicken pesto pasta

Data from sensory profiling

Appearance (3): dull, but presentable
Taste (3): lemony, herbs, strong pesto flavour
Aroma (5): herb, strong, slightly citrusy
Texture (5): soft, tender, smooth

Scale
1 – unsatisfactory
2 – okay
3 – satisfactory
4 – good
5 – very good

Sensory profiling graph



Nutritional analysis

Chicken Pesto Pasta

NUTRITION INFORMATION

Serving size: 375 grams

	Average Quantity per	Average Quantity per 100g
Energy	2123 kJ	562 kJ
Protein	38.84 g	10.28 g
Fat, Total	15.79 g	4.18 g
- Saturated	2.64 g	0.70 g
Carbohydrate	43.84 g	11.60 g
- Sugars	2.43 g	0.64 g
Added sugars	0.18 g	0.05 g
Sodium	504.88 mg	133.64 mg
Dietary fibre	13.91 g	3.68 g

Conclusion:

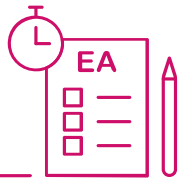
The chicken pesto pasta also displays moderate sensory appeal, with dull visual presentation (3/5) offset by a pleasant aroma (5/5) and a soft, tender texture (5/5). Its herbaceous, citrus-infused taste rated 3/5 is satisfactory. From a nutritional standpoint, it offers strong health alignment with 38.84g protein, 13.91g fibre, and low saturated fat (2.64g) per 375g serve, along with vegetables like spinach and tomatoes, and whole grains from the pasta. With no additives and a manageable sodium level (504.88mg), it meets [redacted] standards for accessible, nutritious meals. While the texture and aroma are strengths, visual enhancements and confirmation of shelf stability are required before this product can be positioned as successful healthy ready-made meal option. This formulation meets all four sensory factors with only minor improvements needed in visual appeal, as this is the sensory property that consumers first notice. Production viability is strong with a stable composition and expected shelf life under refrigeration. If packaged correctly, this product can have a shelf life of up to 3 weeks due to ready-made meal packaging, and refrigerated conditions of 0-5 degrees Celsius. This meal can also be frozen and consumed within the due date and heated before consumption. It is nutritionally sound, aligns with [redacted] existing product trends, and uses ingredients that can be sustainable and locally sourced.

Excerpt 5

Evaluation of proposed solution using self-determined criteria and refinements of ideas for a proposed solution

Self-determined criteria	Evaluation	Recommendations for improvement
-Is a reformulation of a [redacted] product, catering for obese consumers (Pizza, chips, mini pizzas) -The prototype is well received (ratings of 4 or 5 out of 5) by the sensory profilers across all sensory properties, including texture, aroma, taste and appearance -The product must utilise the chemical and functional properties of fats, proteins and carbohydrates relevant to the problem, such as physical manipulation, addition of additives, application of heat, leavening, gelatinisation, maillard reaction, denaturation, aeration and dextrinisation -Aligns with [redacted] values and ethos by utilising environmentally friendly ingredients to produce quality tasting food -The production of the products must take minimal time, effort and equipment to produce, making it more convenient -Contain minimal ingredients that are highly processed -To cater to the nutritional requirements of the consumer with obesity, the product must:	-Is a pizza slice, one of [redacted] current products, reformulated to cater for obese consumers -The final proposed solution, the turkey and chicken pizza slice, was well received by the sensory profilers across all sensory properties, receiving a 4 or 5 out of 5 for each one -The product utilises relevant chemical and functional properties of fats, proteins and carbohydrates relevant to the problem, including physical manipulation, addition of additives, leavening, application of heat, gelatinisation, maillard reaction, aeration, denaturation and dextrinisation -Aligns with [redacted] values and ethos, by providing quality tasting food that is mindful of the environment, avoiding ingredients harmful to the environment, such as vegetable oils -Contains minimal ingredients that are highly processed, the only ingredient that is highly processed being the deli meats -The production of the pizza slice takes minimal time, effort and equipment, only requiring common kitchen equipment. As well as taking	Additional improvements to the final proposed solution include using real shredded turkey and chicken to increase texture. As well as reduce the fat content, as it would be a leaner cut of meat and sodium as it would be natural, rather than highly processed, with no additives or preservatives. An additional improvement, regarding the texture of the dough could be to add some water to combine the mixture, kneading the dough for longer and letting it rest to develop gluten strands, allowing the dough to achieve the desired consistency. The taste, texture and aroma of the sauce could be enhanced through the substitution of the pizza base sauce for passata sauce, mixed with fresh herbs. This would provide a sauce with more flavour and a more appealing aroma as well as a texture that is smoother and less thick. The improvement would provide an additional benefit of reducing the sodium content.
• Utilise a Low GI source for the carbohydrate component of the dough • Total fat have less than 10g per 100g • Saturated fat, contain less than 3g per 100g • Use low-fat cheese as a substitute for regular cheese • Low sugar (15g or less per 100g) • High in protein (10g per 100g is good, 15g per 100g is best) • Acceptable level of energy for a snack (600kJ or less) • High in fibre (3g or more per 100g) • Sodium (less than 400mg per 100g is good, less than 120mg per 100g is best)	only 5 mins to create the base, 10 mins to prebake the base, 5 mins to assemble the toppings and 10 mins to to bake the toppings -The base utilises a low-GI source of carbohydrates, using wholemeal flour which is higher in protein and fibre and low in GI, allowing for a longer and slower release of energy -Energy is less than 600 kJ per serving at 578 kJ -Total fat is less than 10g per 100g at 2.6g, reduced from the prototype which was 6g -Saturated fat is less than 3g per 100g at 1.3g, which is less than the prototype which was at 2.9g -Uses low-fat cheese as a substitute for regular cheese, aiding in maintaining a low-fat content for the pizza slice -Low in sugar, within the recommended 15g or less per 100g at 2g, less than the 2.6g in the prototype -High in Protein, within the 10-15g per 100g range at 12g, improving from the prototype's 10.3g -High in Fibre with more than 3g per 100g at 4g increasing from 1.8g in the prototype, -Sodium less than 400mg at 367mg, reduced from 435mg but is still relatively high due to the use of deli meats to increase protein	

External assessment



External assessment (EA) is developed and marked by the QCAA. The external assessment for a subject is common to all schools and administered under the same conditions, at the same time, on the same day. The external assessment papers and the EAMG are published in the year after they are administered.

Examination (25%)

Assessment design

The assessment instrument was designed using the specifications, conditions and assessment objectives described in the summative external assessment section of the syllabus.
The examination consisted of three short response questions and one extended response question (59 marks).

Assessment decisions

Assessment decisions are made by markers by matching student responses to the external assessment marking guide (EAMG).

Effective practices

Overall, students responded well to:

- Question 1a, explaining the significance of bold font in the ingredient list of a food label
- Question 1b, identifying the component containing gluten and proposing a suitable alternative
- Question 2a, explaining how a reformulated meal better meets the needs of the elderly NCM
- the extended response question when
  - analysing the problem to determine company and NCM requirements
  - analysing sensory profiling data of prototype formulations
  - proposing refinements to the solution.

Practices to strengthen

When preparing students for external assessment, it is recommended that teachers:

- provide opportunities for students to practise analysis of formulations, including
  - determining the best and poorest sources of nutrients that are important for NCM requirements
  - the explicit use of nutritional data to justify choices in relation to NCMs
  - identifying trends, making comparisons and drawing conclusions when analysing data, e.g. Prototype 1 had the poorest sensory profiling in all aspects in comparison to Prototypes 2 and 3. Most respondents rated it poor to fair for taste (28), aroma (30) and appearance (32)

- provide opportunities for students to propose specific refinements to prototypes based on nutritional and sensory data and consumer trends, e.g. reducing sodium by using salt-reduced stock, improving texture by substituting carrots for squash
- provide opportunities for students to practise evaluation of prototypes, including using information and data to support judgments
- encourage students to practise past external assessment, including
  - analysing stimulus material to determine specific solution requirements
  - analysing prototype formulations against each of the solution requirements
  - determining and evaluating the most appropriate solution and proposing justified recommendations for enhancements.

Samples

Short response

Question 1

This question required students to:

- explain the significance of bold font on the ingredients list of a food product label, identify the component containing gluten and propose a suitable alternative ingredient
- use the nutrient profiling scoring criterion (NPSC) for the product to determine and explain if a claim could be made and to justify product suitability for the fitness-focused NCM.

Effective student responses:

- explained the use of bold font to provide allergen information to consumers, identified that wholegrain wheat flakes contain gluten and proposed a suitable alternative
- used NPSC data to support the allowance of a claim by the food company and the suitability of the product for the fitness-focused NCM.

Question 2

This question required students to:

- explain how a reformulated main meal better met the nutritional requirements of the elderly NCM
- analyse two dessert formulations to determine the better option for the elderly NCM and identify and justify a change to the formulation in relation to the needs of the elderly.

Effective student responses:

- provided two explanations of how the reformulated meal better met the needs of the elderly NCM
- selected Product 1, Chocolate pudding, as the best option for the NCM and justified the selection with data in relation to the needs of the elderly
- identified and justified an appropriate change to the formulation to improve its suitability for the NCM.

Question 3

This question required students to:

- explain nutritional disadvantages for obese consumers experiencing coronary heart disease of regularly consuming a ready-made meal product and use provided alternative food components to propose and justify refinements to the meal to meet the needs of the NCM.

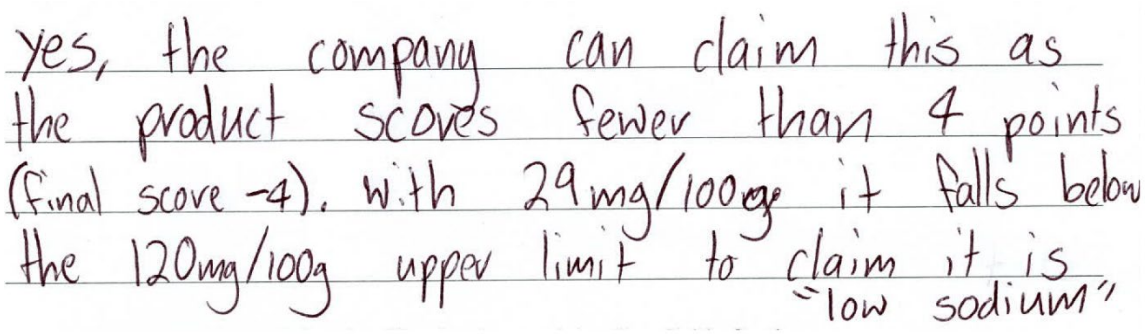
Effective student responses:

- explained two disadvantages of a formulation for the NCM and provided justifications with data that related to specific NCM requirements
- used the alternative food components to propose and justify refinements that would meet the needs of the NCM.

These excerpts have been included:

- to demonstrate the use of NPSC data to explain why the product can make a low sodium claim (Question 1c, Excerpt 1)
- to demonstrate appropriate justification of how Product 1, Chocolate pudding, is the better option for the elderly NCM (Question 2b, Excerpt 2)
- to demonstrate identification of an appropriate refinement to the product to better meet the needs of the elderly NCM, including use of appropriate data to support the response (Question 2c, Excerpt 3)
- to demonstrate discerning explanation of two nutritional disadvantages of a product for an obese consumer with coronary heart disease, including the use of appropriate data to justify the response (Question 3a, Excerpt 4)
- to show the proposal of appropriate refinements to the formulation to better meet the needs of the NCM, including logical reasons to support the response (Question 3b, Excerpt 5).

Excerpt 1



Excerpt 2

Product 1: Chocolate pudding is the better option for the elderly NCM. The elderly NCM requires increased protein to maintain muscle mass and function, and Product 1 contains 9.9g per 100g, compared to Product 2 which contains 2.8g per 100g. They also require a diet high in calcium to maintain bone health and reduce fracture risk. Product 1 contains 71mg of calcium per 100g, with Product 2 containing 64mg per 100g, justifying product 1 as more suitable

A diet with low sugars is beneficial for elderly consumers to maintain health and prevent diet related diseases. Product 1 contains less sugar than product 2 (5.3g vs 13.3g) making it more suitable

Excerpt 3

The elderly NCM requires a diet high in fibre for bowel health and satiety. Product 1 only contained 0.1g of dietary fibre per 100g. To increase this, a high fibre food such as rolled oats could be incorporated.

Excerpt 4

1) It is high in saturated fat with 2.5 g/100g which worsens LDL cholesterol. This is due to the cream & butter. As obese cosumers are at risk of heart disease. Fat is kilojoule dense.
2) It is high in kilojoules which causes further weight gain due to excess energy. Each serve contains 2100kJ. Additional weight places strain on heart worsening CHD.
3) Sodium is high with 137mg, increasing blood pressure & worsening CHD.

Excerpt 5

2 refinements that would meet the needs of obese consumers experiencing CHD could be replacing the vegetable oil for olive oil and replacing the mashed potatoes with brown rice. Replacing the vegetable oil with olive oil would be ~~bene fic~~ beneficial as it is a mono-unsaturated fat that lowers cholestrol - a ~~addit~~ concern for obese consumers. Replacing the mashed potatoes for brown rice would meet the consumer needs as its high fibre content would provide a ~~sl~~ slow realease of energy, increasing satiety and benefiting obese consumers who are facing a sustained energy imbalance.

Extended response

The following excerpts are from the extended response question. It required students to use the problem-solving process to determine the most suitable prototype formulation for the lactose-intolerant infant NCM.

Effective student responses:

- analysed the problem to determine viable solution requirements for each stakeholder
- analysed how prototype formulations met the solution requirements of consumer preferences and solution requirements of the NCM
- analysed the sensory properties of each prototype formulation to determine best and poorest ratings for each prototype
- identified and justified the best prototype formulation, including nutritional and textural appropriateness, speed of preparation and cost effectiveness
- made effective recommendations to enhance the solution, based on data from the stimulus.

The following excerpts are from Question 4.

Excerpt 1 demonstrates a critical analysis of how prototypes met the solution requirements in relation to consumer trends and NCM needs.

Excerpt 2 demonstrates effective and justified recommendations for refinements of the solution, supported by data.

Excerpt 1

Prototype 1 (P1) Savoury Pancakes meet the trends of having a low price of $2.55 per serve, although it's a lower serve of 120g, convenience due to plastic packaging and simple heating instructions, and encourages self-feeding as the infant can pick it up to eat. It contains less than 15% in sugar energy at 14.5%, which is quite high, and is the only prototype that contains less than 50mg ~~in~~ of sodium at 48mg per 100g. P1 does not contain any lactose ingredients and has high calcium (31.3g/100g) to support development and ensures no deficiency due to lack of formula or breast mik, similarly iron is ~~highest~~ at highest at 0.9mg/100g. However, sensory data is quite low; 32 profilers rated appearance poor to fair, 26 say aroma is ~~poor-fair~~ poor-fai and taste at 25 rating poor-fair making P1 the lowest sensory data, however the texture is most appropriate with small chunks.

Excerpt 2

Despite it's high quality characteristics it can be improved in some areas. Firstly, the formulation should add spinach, this will increase the iron content, improving it from 0.8 mg/100g. This will further aid infants growth and prevent anaemia.* Secondly, The pasta should be substituted with wholegrain pasta. This will increase the fibre in the formulation. This is important as it aids the digestive system and prevents constipation, which infants are prone to. It maintains ~~the~~ a similar texture for the sensory profile and safety (unlike another alternative e.g. brown rice).*½ Finally, fresh tomato

[1] Adding spinach will have little impact on flavour and may be blended to prevent it's ~~**~~ impact on texture.