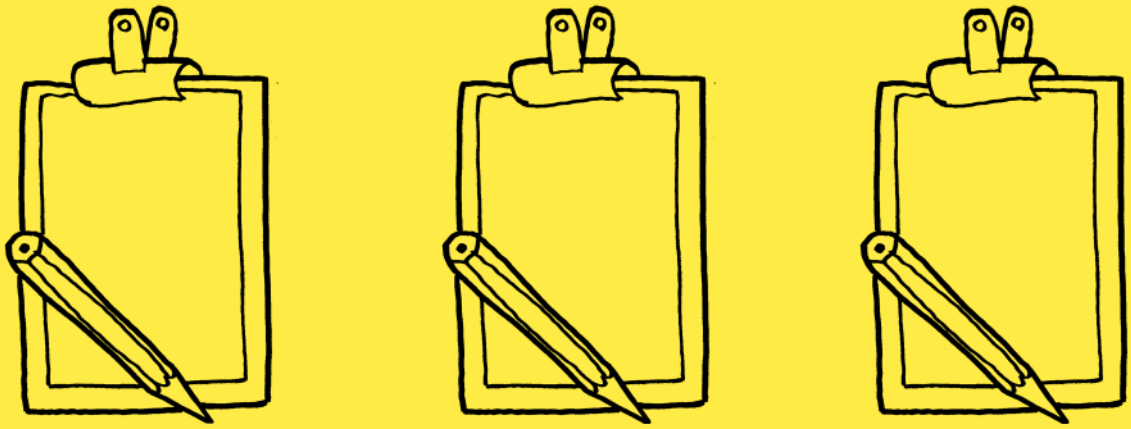

NEA 1
Food Investigations

10 Tasks

by Jenny Ridgwell

NEA 1 Food Investigations
10 Tasks

Contents

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My thanks for artwork to Dave Smith and Jill Oliver for experiments

Contents

Food Investigation Tasks

How to use this book
The Task Investigations match the requirements of the exam boards AQA, OCR and Eduqas for Food Preparation and Nutrition GCSE NEA 1.

We focus on 10 Tasks that might be set for the Food Investigation Task, and show how to carry out Investigations to include science and understanding of ingredients. We've explored ways to reduce writing and present work in a smart way.
The Tasks chosen are possible choices that might be made by the exam boards for NEA 1.
I have worked through the **Experiments** and presented my results for this book. They can be used as exemplars for other NEA 1 Investigations.
Your experimental results will be very different!
Good luck with the Investigations and have fun with them.

Jenny Ridgwell

Task 1 - Ingredients to thicken sauces and soups
Task 2 - Chemical raising agents used to make scones, cakes and biscuits.
Task 3 - Fats used in shortcrust pastry.
Task 4 - Flours used in shortcrust pastry.
Task 5 - Flour used in bread.
Task 6 - Flour used in pasta.
Task 7 - Egg white foams and meringues.

10 Top Tips for Food Investigations

1. Think of the **AIM** of the Investigation when you start.
2. Make sure you link **science words** to the Task.
3. Keep **Experimental** work clear and simple - limit how many samples you cook.
4. Make sure you test **fairly** - compare the same things - the same size scone or piece of pastry.
5. Keep samples small - you can easily taste small samples of scones.
6. Some recipes won't work - this is part of the Investigation so get used to it!
7. Choose cheaper ingredients if possible - use margarine instead of butter for pastry tests.
8. Learn how to **Annotate** - use it on photographs, charts and tables.
9. Show your results in interesting and simple ways - take photographs of charts and results.
10. **Analyse** results, **Evaluate** Investigations.

Food Investigation Tasks

This resource explores the Task for NEA 1 - Non Examined Assessment for **all** exam boards.

For each Task I show how to carry out
- Research,
- Investigation,
- **Analysis** and Evaluation.

Check the details for each exam board, but the broad methods are the same.

Key words used by exam boards
- **Research** and plan the Task - think of the **Aim of Investigation**
- Explain what you think will happen.
- Write a **Hypothesis**.
- **Investigate** the working characteristics, function and chemical properties of ingredients through practical **Experiment**s
- Use appropriate **food science words**.
- Carry out **Sensory testing.**
- **Analyse** and **Evaluate** the **Experiments** and research.
- Produce a report that includes photographs of the **Investigation** with **Annotations.**
- Use **food science** words to explain results.
- Write **Conclusion***s*.

The food science bit

This section explains the **food science** that you are investigating for each task.

The pencil shows Questions

The Laptop shows computer work to be practised for the Task.

The Aim shows the Aim of your Task.

Key words from exam boards are in bold
- Research
- Investigation
- Analysis
- Evaluation - Evaluate
- Hypothesis
- Annotate
- Food science
- Experiments
- Fair test
- Sensory testing and tasting
- Conclusions

Other Key words or phrases are in bold
- Gluten
- Shortening
- Chemical raising agents
- Descriptor
- Gelatinisation
- Starch
- Star Profile

Ingredients to thicken sauces and soups

The Task

Example of a Food Investigation NEA Task 1 Eduqas

There are a number of ways to thicken a sauce. Investigate the working characteristics and the functional and chemical properties where appropriate, of the different methods used to thicken a sauce.

Test, cook, photograph and Investigate

Example of AQA NEA Task 1
Investigate the ingredients used to thicken sauces and soups.

Carry out
- Research,
- Investigation,
- Analysis and **Evaluation** for the Task.

- Include **Research** into how ingredients work and why.
- Include charts, graphs and diagrams.
- Analyse the Task, explain background **Research**.
- Look at working characteristics, functional and chemical properties of the ingredients.
- Plan the Investigation.

This chart shows a summary of work for the Task.

Title of the Task	**Investigate** how to thicken sauces and soups
Summary of Research	Find out the ingredients used to thicken sauces. Choose **starchy** ones to **Investigate**. Find food **science** words, choose **Experiments** and write an Aim.
Hypothesis	When a starchy ingredient is mixed in cold liquid and heated, it will thicken. Some starchy ingredients thicken sauces and soups better and quicker than others.
Plan of action	Make up 4-6 samples of sauces using different **starches**, taste test and measure viscosity.
Experiments	Look at **starches** and test how they thicken. Measure viscosity and carry out a taste test. **Investigate** the amount of **starch** in different starchy ingredients.
Analyse and Evaluate	Look closely at the results of **Experiments** showing viscosity and thickening by starches and interpret what you have found. Comment and explain the results, and evaluate the **Hypothesis.**
Conclusions	Compare results and see which **starch** thickens the best.

Ingredients to thicken sauces and soups

Research

- What ingredients are used to thicken sauces and soups?
- Which ingredients give the result you want?
- What is the food science of sauce thickening?

Aim for your Task

Write a short aim for your Task.

After some research, write a short **Hypothesis.**

Hypothesis

The **Hypothesis** can be a statement which may be proved or disproved.

- You are investigating how ingredients work and why.
- Write what you think will happen in the investigation.

My **Hypothesis** for the sauce making Task:

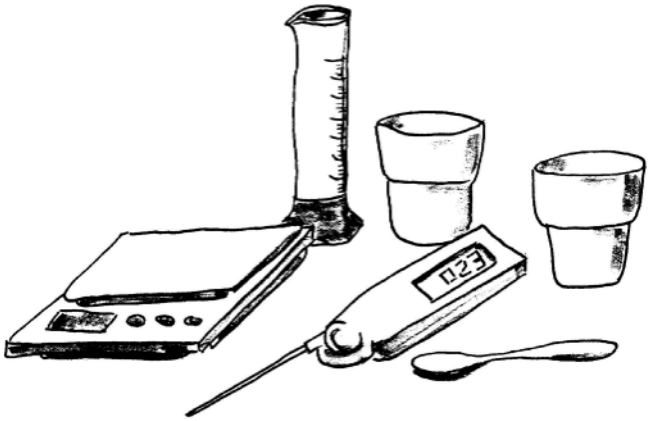
*When a **starchy** ingredient is mixed in cold liquid and heated, it will thicken.*
*Some **starchy** ingredients thicken sauces and soups better and quicker than others.*

You need a **fair test** to compare like with like

- The **same** amount of **starch** heated with
- The **same** amount of liquid for
- The **same** time.

Aim
To find out the best starch to thicken a sauce by heating starches in water.

Write the Aim of your Investigation.



Measure accurately for the Investigation**.**
Use measuring cylinders, plastic pots, digital scales and temperature probes.

Getting ideas

Think of words linked to thickening sauces.
This will give you ideas.

Use the internet for research - Pinterest is good.

To do

Just for fun explore a Word Art with the science words for your Task.

Ingredients to thicken sauces and soups

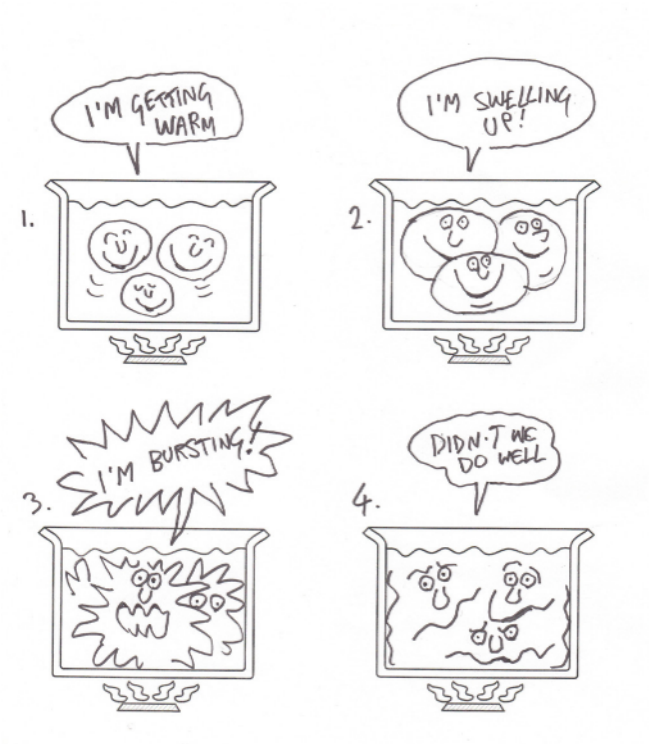
Food science of thickening sauces

Key food science words to describe the function of starch in a sauce		
• Viscosity • Gel • Starch	• Gelatinise • Thicken • Opaque	• Absorb • Temperature • Swell

The food science bit

How ingredients work and why
Thickening sauces with **starches**

- **Gelatinisation** happens when a **starch** and liquid mixture are heated.
- The water enters the **starch** granules and they **swell** and change texture.
- As more water is taken in, the granules expand, and the mixture becomes **viscous** and **thick.**
- This results **in a gel** which thickens sauces by the process of **gelatinisation.**
- Some **starches** break down with further heating and water is forced out. This process is known as **retrogradation.**
- This also happens when the sauce is chilled and frozen.



Gelatinisation happens when **starch** and liquid such as water are heated together.

To do

1. Explain how the process of **gelatinisation** helps a white sauce to thicken. (4 marks)

Ingredients to thicken sauces and soups

Which starchy ingredient to use?

Wheat and maize are grain **starches.**

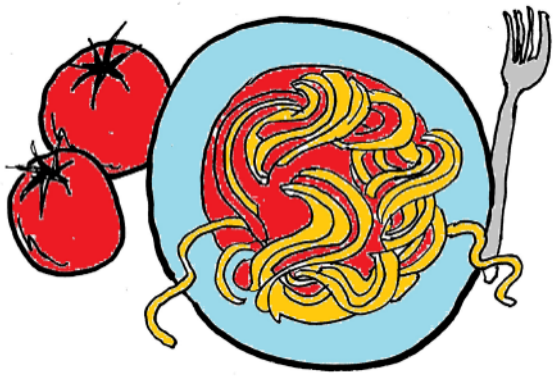
Potatoes are tubers which grow under ground.

Starches from these plants are used in cooking to thicken mixtures.
Many sauces are thickened with **starch**.

Cheese sauce can be thickened with
Wheat flour, cornflour.

A sweet sauce can be thickened with
Cornflour, arrowroot, wheat flour...

Curry sauce can be thickened with
Gram flour, wheat flour, rice flour.



Tomato sauce can be thickened with
Wheat flour, cornflour.

To do

1. Choose 2 **starchy** foods and describe why they are used to make a sauce or soup.
(2 marks)

2. Use The Nutrition Program or another **Nutritional Analysis** program to find 5 foods which are high in **starch**. These foods should be used to thicken soups and sauces.
Complete the chart - Foods which contain starch.

Tip - look for foods high in Carbohydrate - **Starch** is a Carbohydrate. (5 marks)

Foods which contain **starch**
1.
2.
3.
4.
5.

Answers at the end of the book.

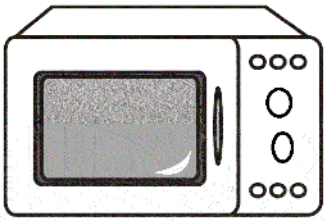
Ingredients to thicken sauces and soups

Choose different starches - arrowroot, cornflour, plain flour, self raising flour, gram flour.

Investigate with Experiments

Test how different starches thicken a sauce.
Use a **fair test** to compare like with like.

- The **same amount** of starch (10g) heated with
- The **same amount** (100ml) of the **same liquid (water)** for
- The **same time.**



Check exam board for number of tests.

Starches for sauce making

Choose 4-6 starches to test -
Plain flour, cornflour, arrowroot, self raising flour, gram flour... you choose.

Method

- Describe what each starch looks like when dry.
- Use the same amount of starch (10g), same amount of liquid (100ml water) each time.
- Blend the starch into 50ml cold water then add the other 50ml. Stir to make smooth.
- Heat a sample in a bowl in the microwave. Remove every few seconds, stir and when the mixture begins to thicken record the temperature.
- Hold the temperature probe in the mixture until the temperature settles. Heat the samples to 95ºC to make sure they are well cooked.
- Present all the results. Allow sauces to cool and note the appearance and thickness.
- With a clean spoon, taste each mixture and record the results.

Experiment tips

- The microwave oven saves time and washing up when cooking these sauces!
- If you heat the mixtures in a small saucepan, double the amount of starch and liquid. It is harder to measure temperature and stop the mixture from burning in a saucepan.
- Use digital scales to measure the starch accurately.
- A measuring cylinder is more accurate than a measuring jug.
- A food temperature probe measures temperature.

Equipment
Digital scales, measuring cylinder, 4 bowls, microwave, tasting pots, food temperature probe, teaspoons

Ingredients to thicken sauces and soups

Tasting and testing

Put the sauces into pots for **Tasting**.
Make sure all the pots are the **same** size and shape.
Serve the sauces at the **same** temperature.
Take digital photographs of your results.

Sauces in small pots ready for tasting.

Annotate your photographs
Label the sauce samples in pots on a board and photograph with a digital phone, ipad, or camera. Transfer the image to the computer and add a label.

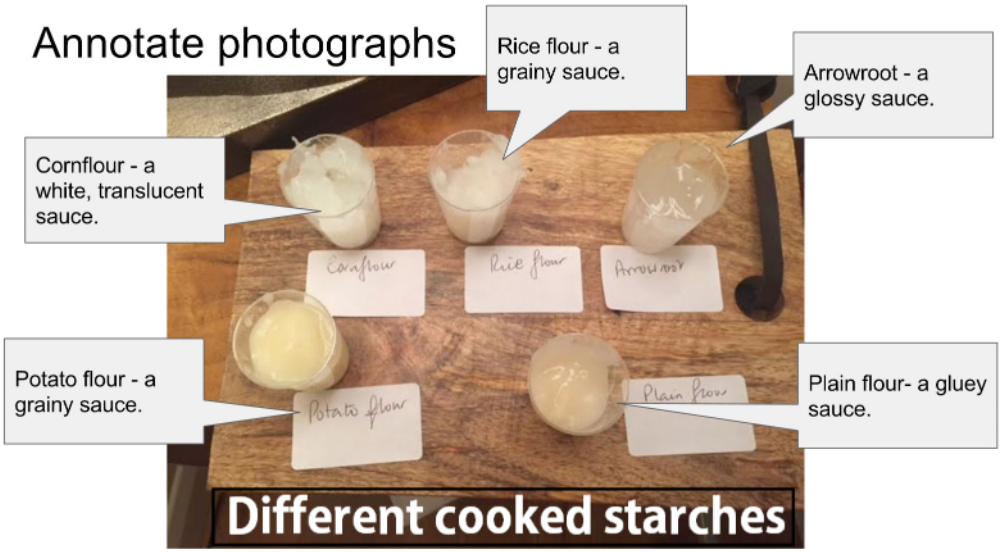
Annotate the photograph to explain what the results mean. My example uses Callouts which show how the sauces look like when cooked.

Annotations

- *Show what you have found out.*
- *Explain how it tastes.*
- *Describe the texture.*
- *Explain your results.*
- *Show ways to improve*

To do

Use a computer to **Annotate** a photograph using Callouts or other ways of adding information.



Ingredients to thicken sauces and soups

Viscosity test for sauce thickness

Viscosity is the thickness and rate of flow of a sauce.
The food industry uses **viscosity tests** to help process and pack foods such as tomato ketchup and custard.
They need to know how thick the sauces are when they pipe them down tubes to fill up sauce bottles and pots.
A scientific viscosity test takes a lot of time and uses expensive equipment, so here's a quick idea.

Viscosity is rate of flow of a sauce.

Rate a sauce on its thickness - viscosity (1 to 5)

Water = 1 - it flows easily. Honey - runny = 3 - it's a bit sticky and does not flow as easily.
Peanut butter (thick) = 5 - it doesn't flow at all.

Starchy thickeners	How thick - viscous? Mark out of 5	Comments
Sauce made from Plain wheat flour		
Sauce made from Cornflour		
Sauce made from Arrowroot		
Sauce made from Rice flour		

Add your own **starchy** ingredients to the chart.

Ingredients to thicken sauces and soups

Viscosity test for sauce thickness

This chart shows the viscosity of the different sauces.
Give the sauces a mark out of 5, where
1 = not thick and 5 = very thick.

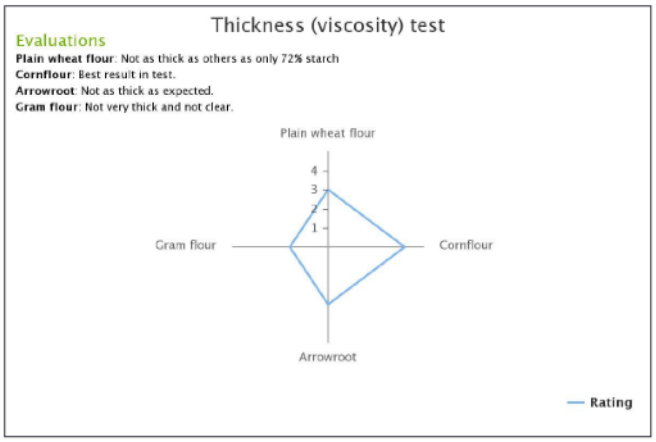
Starchy thickeners	How thick: viscous? Mark out of 5	Comments
Plain wheat flour	3/5	Not runny but quite thick
Cornflour	4/5	Gluey and quite thick
Arrowroot	3/5	Clear and quite thick
Gram flour		

Viscosity tests marked out of 5 for thickness

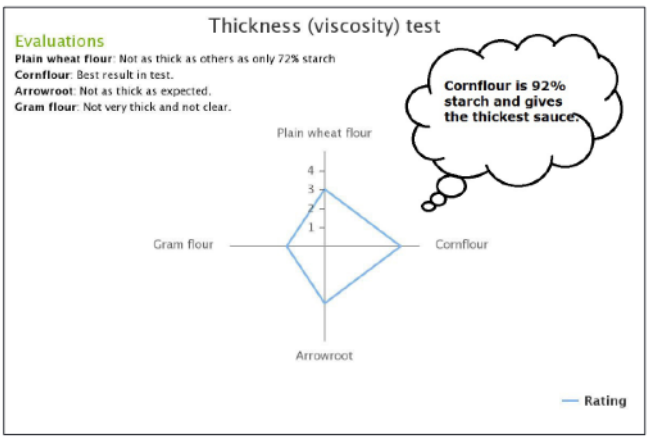
Star Profile for viscosity test
Use the **Nutrition Program Star Profile** to show your results.
Or use an Excel spreadsheet.

Open The Nutrition Program and go to

- My Recipes
- + New Recipe - type in Thickness (viscosity) test, Portion 1
- Go to **Star Profile**
  Name Thickness (viscosity) test
- In **Descriptor**, list the starches you tested.
  My tests are -
  Plain wheat flour
  Cornflour
  Arrowroot
  Gram flour
- Put your marks out of 5 in the Rating.
- **Evaluate** your results in the **Evaluations** box.
- Export your **Star Profile** as a jpg for your Investigation.
- **Annotate** the results for your **Analysis.**



Thickness test on **Star Profile** with Evaluations.



Annotate the **Star Profile**

To do

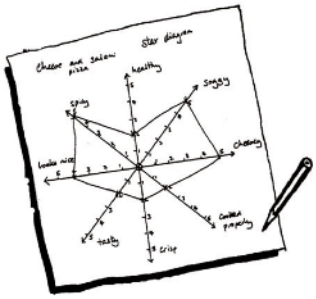
Use the Nutrition Program or Excel spreadsheet and complete a **Star Profile** to practise. Copy the starches listed - plain flour, cornflour, arrowroot, and gram flour.
Type in the Rating and complete the **Evaluations.**

Ingredients to thicken sauces and soups

Tests to use
Taste test samples of your cooked sauce.
See the end of this book on how to set up a **Tasting and Sensory Tests**.
Use a **Tasting** panel to get several views.

Serve samples in the same way.

Star Profile for starchy sauce Tasting



Star Profiles can be hand drawn or use Excel.

Taste your sauces and record your results.

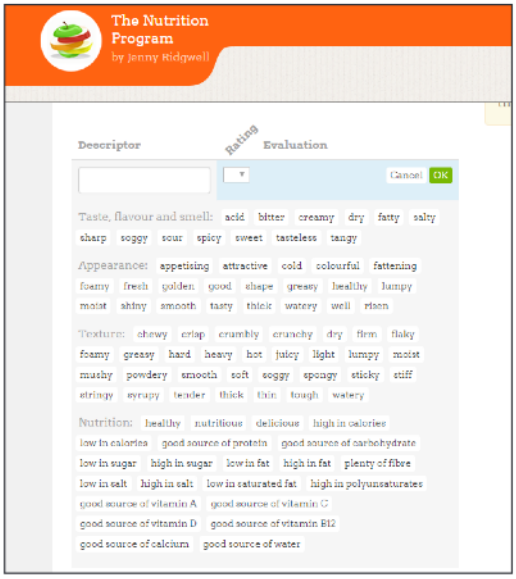
Tasting words to use

- Clear, clingy, creamy, glossy, gluey, gritty,
- High sheen, opaque, pulpy, shiny, smooth,
- Sticky, stiff, thick, thin, viscous, yellowy.

Use the Nutrition Program to draw a **Star Profile**.
Or draw one on Excel.
Open The Nutrition Program and go to

- My Recipes and create a Recipe.
- Go to Star Profile
- +Add **Descriptor**
- The Nutrition Program lists **Tasting** words (Descriptors) to use.
- Choose words from the Nutrition Program list - Creamy, tasteless, lumpy, shiny, smooth, thick ..
- **Or**

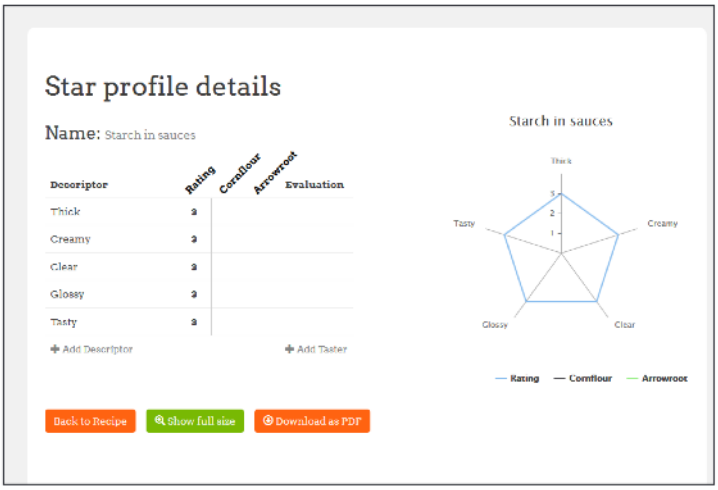
Choose your own - Solid, gluey, beany ...



Nutrition Program Tasting words for a sauce.

In Star Profile

- Type in the Name - Starch in sauces
- Write the **Descriptors** for your sauce:
- Thick, creamy, clear, glossy, tasty...
- Give each **Descriptor** a mark out of 5.
- 1 = not and 5 = very.
- So 3 out 5 = not very thick, 5 out of 5 = very thick. (Continued)



Star Profile for a sauce Tasting.

Ingredients to thicken sauces and soups

Star Profile for starchy sauce Tasting
(Continued)

List the starchy ingredients as each Taster.

- Cornflour sauce
- Arrowroot sauce
- Plain flour sauce
- Rice flour sauce.

Type in your marks for each starch.

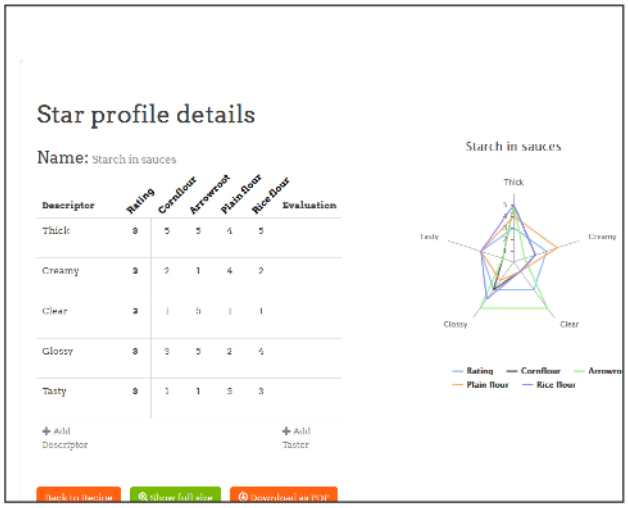
For example, taste and test how clear each starch made the sauce.
Cornflour, and rice flour have 1 mark.
Arrowroot has 5 marks so it makes the clearest sauce.

Complete the **Evaluation** of each **Descriptor** on the **Star Profile**.

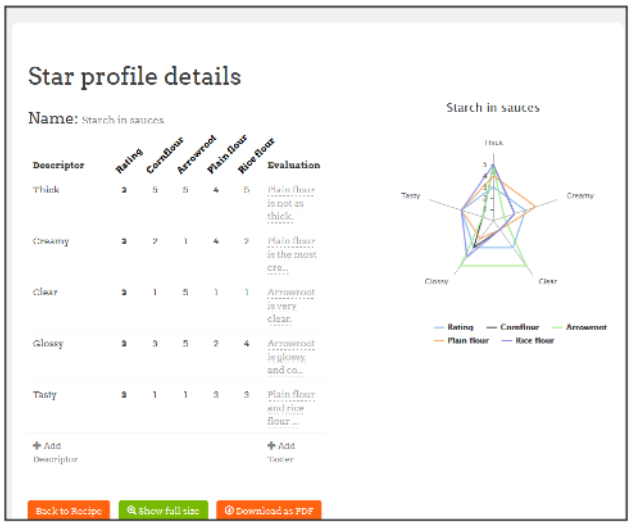
Export the image as a jpg to show the **Star Profile** and the **Evaluation** results.

You can **Annotate** the image with your comments.

(Continued)



This is the screen to complete Tasting results.



This screen shows how to complete Evaluation results.

To do

Use the Nutrition Program and complete a **Star Profile** to practise.

- List each **Descriptor** - Thick, creamy, clear, glossy, tasty...
- Copy the starches listed - cornflour, arrowroot, plain flour, and rice flour.
- Give each **Descriptor** a mark out of 5 for each starch.
- Type and complete the **Evaluation** and Export the work to your Investigation.

Extra Experiment

Test the sauces for **retrogradation.**
Leave the cooked starches to cool or freeze the sauces. Comment if the starchy sauce has cracked. This means the starch has separated out and retrograded.

Ingredients to thicken sauces and soups

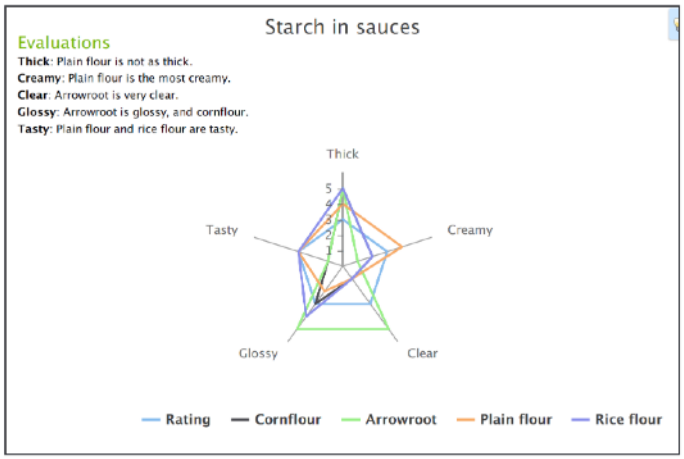
Star Profile for starchy sauce Tasting
(Continued)

Analysis and Evaluation

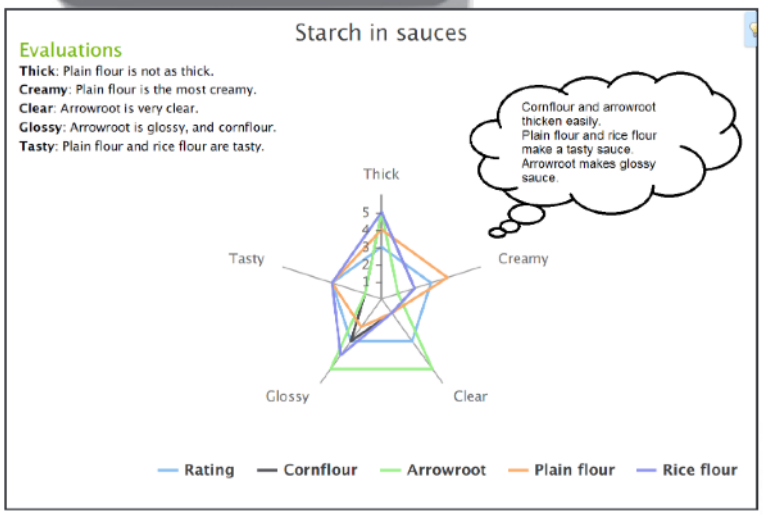
The analysis explains what the results mean.
Try to carry this out during experiments.
Annotate photographs and comment on measuring and tasting results.

You need to
Analyse and interpret results.
Evaluate the Hypothesis
Explain how the results can be used for dishes.

CHECK EXAM BOARD FOR DETAILS



Annotate by adding a Callout to sum up the results.



Put this image in your Investigation results.

To do

Add a Callout to your Star Profile to write comments on your results.

Tasting *notes*

- *Wheat **starch** (flour) makes a thick, stiff, gluey paste.*
- *Cornflour forms a stiff, opaque gel. When the paste cools some water can leak out.*
- *Potato **starch** absorbs more water than the other **starches** and **gelatinisation** temperature is lower, so the mixture thickens quickly on heating. The mixture is very clear.*
- *Arrowroot forms a very clear paste when heated and is used as a glaze for pies and puddings.*

Make Tasting notes of your experiment.

Ingredients to thicken sauces and soups

Analyse and Evaluate sauce results

- **Analyse** and interpret the results of the *Investigation*.
- Sum up and decide on improvements.
- Link **Research** explaining the working characteristics, functional and chemical properties of the ingredient(s).
- **Evaluate** the **Hypothesis**/prediction with reasons.
- The **Hypothesis** is a statement which may be proved or disproved.

My **Hypothesis** for the sauce making task

*When a **starchy** ingredient is mixed in cold liquid and heated, it will thicken.*
*Some **starchy** ingredients thicken sauces and soups better and quicker than others.*

The starchy ingredients did thicken the liquids when heated by gelatinisation.
Ingredients like cornflour thickened sauces really well because cornflour is high in starch.
Other ingredients like potato starch could be used to thicken soups as they have a good flavour for this purpose.

Check List to record results	Yes	Not yet	Comments
I have photographed the results.			
I **Annotated** the photographs and other results.			
I've included some charts.			
I've shown **Sensory** testing methods.			
I **Annotated** the **Tasting** results.			
I've shown **Experiment** results.			

Complete a Check List to record results.

How can this Investigation into thickening agents be used for practical cooking?
(Check if exam board needs this.)

The **Experiments** into different starchy ingredients show that a wide range of foods can be used to thicken sauces and soups. Starches such as tapioca, rice flour, cassava, chickpea and rye flour can be investigated as these starches also add extra flavour.

Conclusions

The Investigation shows the range of flavours and thicknesses that can be produced using different food starches. These foods will make different sauces and soups, using the working characteristics of each starch to give flavour and texture. All the starches gelatinised when heated in a liquid and some thickened at lower temperatures. Foods which were lower in starch, such as plain flour, did not thicken as much as those high in starch such as cornflour.

References
List the books, internet, magazines used.

Website	Information
www.grainchain.com	Resources and help on gelatinisation of flour for sauces.
www.fabflour.co.uk	Resources and information on types of flour.
www.dovesfarm.co.uk	Information on raising agents in flour.
www.bbc.co.uk/food	Articles and information.
www.bbc.co.uk/education	BBC Bitesize revision
www.waitrose.com	Food glossary

Ingredients to thicken sauces and soups

Extra Nutrition Investigation

If a **starchy** ingredient is high in **starch**, then it thickens a sauce better.
Find out how much **starch** is in 100g of some thickening ingredients.

To do

Nutrition Investigation

1. Use **The Nutrition Program** or another Nutritional Analysis program to find the amount of **starch** in 100g of these **starchy** foods.
(4 marks)

Open The Nutrition Program and go to

- My Recipes
- + New Recipe - type in Sauces, Portion 1
- Find ingredient - for example, flour - the screen Nutrition Amount (per 100g) shows Starch in grams.
- Keep changing the ingredient to find answers.

Starch in starchy ingredients	
Starchy ingredient	Amount of Starch in 100g
Plain flour	
Cornflour	
Arrowroot	
Potato flour	

2. When you have found the amount of **starch** in these ingredients, explain which ingredients will thicken a sauce or soup quickly. Give your reasons.
(4 marks)

3. Use the Nutrition Program or another nutritional analysis program to find 5 foods high in starch.

Tip - follow these steps

- My Recipes
- Choose a Recipe
- Find ingredient
- Show: Food high in Carbohydrate.
- Scroll down the list to a food which is not a sugar.
- The first starchy foods are Instant cold water swelling starch, then sago, raw.
- Choose starchy foods that you know and use: potatoes, yam .. (5 marks)

Scones and chemical raising agents

The Task

Recipes for scones and cakes include raising agents to help them rise and give a light, well risen baked product. Investigate *the working characteristics and functional properties of raising agents used to make scones and cakes. Eduqas NEA*
Or
Investigate the use of raising agents in baked products. AQA NEA

Research raising agents, recipes and food science.

Carry out
- Research,
- Investigation,
- Analysis and **Evaluation** for each Task.

This example investigates the raising agents for Scones.
Scones are cheap to make and quick to bake.

Research

- Find the raising agents used in scones and cakes
- Find scone recipes - or cakes with raising agents
- What is the **food science**?
- What **Experiment**s can I do?

Write the Aim of your Investigation.

This chart shows a summary of work for the Task.

Title of the Task	**Investigate** chemical raising agents used for scones.
Summary of Research	Look at scone recipes, find out about raising agents, list **food science** words, choose **Experiment**s. Write an Aim.
Hypothesis	Scones made with the most chemical raising agent - Self Raising flour + baking powder will make the lightest and best scones.
Plan of action	Make up 4 samples using different raising agents, and 1 without raising agents. Bake, taste, measure the height.
Experiments	Fizz test - do a balloon test with Self Raising flour, baking powder, sodium bicarbonate, and cream of tartar. Make scone recipes with different raising agents.
Analyse and **Evaluate**	Look closely at the results of **Experiments** testing different raising agents and interpret what you have found. Comment and explain the results, and **evaluate** the **Hypothesis.**
Conclusions	Compare results to see which is the best risen and best tasting scone, and Evaluate results.

Scones and chemical raising agents

Chemical raising agents to make scones

- Self raising flour - contains baking powder
- Baking powder
- Bicarbonate of soda

Cream of tartar is used in baking powder as the acid ingredient.

The food science bit

Chemical raising agents
How ingredients work and why

- Raising agents such as baking powder and bicarbonate of soda are added to scones and cakes to make them **rise**.
- A **chemical reaction** happens when liquid such as milk or egg is added to the dry ingredients.
- **Carbon dioxide gas** (C02) is given off and bubbles of gas push up the wet dough.
- **Liquid** from milk or eggs is needed for the raising agents to work.
- As the dough cooks, the heat makes the **gas bubbles expand,** pushing up the dough further.
- The liquid in the mixture **evaporates,** the **gluten** in the flour coagulates and sets forming the **framework** of the scone.

To do

1. Give examples of 3 chemical raising agents. (3 marks)
2. Describe how one chemical raising agent helps scones and cakes to rise. (2 marks)
3. Give one reason why cooks use self raising flour for cake baking. (1 mark)

These ingredients contain chemical raising agents

Carbon dioxide gas is given off by raising agents.

Research

What are raising agents made from?

1. **Self raising flour** is made from a softer, lower **gluten** flour mixed with a raising agent such as baking powder. It is used to make scones, cakes and muffins. To make self raising flour add 1 teaspoon of baking powder to 100g of plain flour.
2. **Sodium bicarbonate** (bicarbonate of soda, E500 sodium carbonate) is a raising agent used in soda bread and gingerbread. It is an alkali.
3. **Baking powder** is made from the alkali, bicarbonate of soda and the acid, cream of tartar. As soon as liquid is added to the baking powder, **carbon dioxide** gas bubbles are given off which push up the cake, muffin or scone mixture.
4. **Cream of tartar** is an acid called potassium hydrogen tartrate and it is mixed with bicarbonate of soda to provide the acid ingredient for baking powder.

Scones and chemical raising agents

Use food science words

Key food science words to describe raising agents		
• Carbon dioxide gas	• Chemical reaction	• Sodium bicarbonate
• Gluten	• Alkali	• Evaporate
• Starch	• Gas bubbles	• Cream of tartar

Extra food science bit

Bicarbonate of soda is an alkali.

- It produces more **carbon dioxide** gas if it is mixed with an acid food such as cream of tartar, buttermilk or sour milk.
- Adding acid foods such as yogurt or lemon juice to bicarbonate of soda when making scones, increases the speed that the mixture fizzes and gives off **carbon dioxide** gas.

The formula

sodium bicarbonate + liquid

= carbon dioxide + water + sodium carbonate

Hypothesis

The ***Hypothesis*** can be a statement which may be proved or disproved.

- You are investigating how ingredients work and why.
- Write what you think will happen in the investigation.

My **Hypothesis** for the raising agent task *Scones made with the most chemical raising agent - Self Raising flour + baking powder will make the lightest and best scones.*

This forms the basis of the Task which can be **Evaluated** to see if true.

Scones and pastry change colour and become golden when baked. This is called **dextrinisation.** Dextrinisation is when dry heat changes a **starchy** food to dextrin and the colour changes to brown.

To do

1. Explain why some cooks add an acid ingredient to a scone dough made using bicarbonate of soda. (2 marks)
2. Describe what happens when scones and pastry change colour during baking. (2 marks)

Scones and chemical raising agents

Investigate and Experiment

- Decide which chemical raising agents to test.
- Choose a recipe for the scone samples.
- **Experiment** with raising agents - the balloon or Fizz test.
- **Experiment** and make scones with raising agents.

Make sure the tests are **fair** and that there is a control.

For this **Experiment** I'm choosing the scone made with self raising flour as the control as this flour is used in most scone recipes. I've made a scone with plain flour and no raising agent, just to check. All scones are rolled out the **same** size to 2½ cm thick.

Test, cook, photograph and Investigate

Experiment

The Fizz test - explore how the raising agents react to warm water.

Method

1. Put 1 teaspoon of each of the following raising agents into a glass or plastic bottle.
2. Try Self raising flour,
   Baking powder,
   Bicarbonate of soda and
   Cream of tartar.
3. Add 50ml warm water into each glass or bottle and watch which ones fizz - giving off **carbon dioxide** gas.
4. Put a balloon over the plastic bottle to collect the gas.
5. Which ones make the balloon rise quickest?

Watch how raising agents react to warm water

My results

Baking powder fizzed really quickly, self raising flour and bicarbonate of soda fizzed more slowly. Then I mixed the bicarbonate of soda and cream of tartar together - fantastic fizz!

Experiment

Test how the different raising agents make scones rise.
Change one ingredient in the recipe - in this case the raising agent. Butter, sugar and milk stay the same.
Leave out the sugar if you wish.
For my **Experiment** I've made 4 scones with different raising agents:

1. Self raising flour (which contains baking powder)
2. Plain flour + ½ tsp baking powder
3. Self raising flour + ½ tsp baking powder
4. Plain flour + ¼ tsp bicarbonate of soda and ¼ tsp cream of tartar

Find a plain scone recipe and scale it down to make a small sample.

Search for a scone recipe.

Scones and chemical raising agents

Investigate and Experiment

Sample scone recipe

Ingredients

100g flour – plain or self raising
1 teaspoon sugar
30g butter or margarine
60ml milk - you might need a bit more to mix to a dough

Ingredients for 4 samples
200g self raising flour,
200g plain flour,
Baking powder,
Bicarbonate of soda,
Cream of tartar,
4 tsp sugar,
120g butter or margarine,
300ml milk (allow extra to mix to a dough).

Method

1. Preheat the oven to 220°C/Gas 7.
2. Rub the butter or margarine into the flour and sugar to form breadcrumbs.
3. For Investigations a food processor helps to keep the making time the **same** of each sample.
4. Put this mixture in a bowl and stir in the milk with a table knife until the mixture forms a dough.
5. Quickly work the dough smooth with your hands and pat out onto non stick paper until it is 2.5cm thick. Avoid rolling out the dough.
6. Cut with a 7-8 cm cutter or small glass. Repeat with all scone samples. Remove excess dough.
7. Bake in the hot oven for 12 minutes - use the oven timer to check.
8. Remove scones onto a cooling rack and photograph for your work.
9. Measure the scone height to see how much each one has risen.

Equipment
Digital scales, measuring spoons or measuring jug, 4 bowls, knife, cutter or small glass, baking tray with non stick baking paper, cooling rack, ruler, oven timer, cutting board.

Take photographs and label results.

Experiment tips

- When liquid is added to the flour and the chemical raising agent mixture, the raising agent gives off **carbon dioxide** gas.
- Mix **quickly** with milk, work into a dough, pat and cut into scone shape.
- Get your scone mixture into the oven quickly once the 'wet' ingredients have been added to the 'dry' ingredients as the mixture is expanding!
- Bake all scones **together** for 12 minutes.
- Take out, place on a cooling rack and photograph.
- Make the samples in the **same** way and cook for the **same** time.

Scones and chemical raising agents

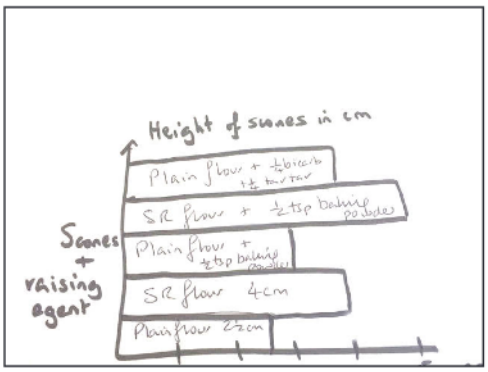
Analyse and Evaluate
Photograph your work -
Annotate (add labels to) the photograph to explain results.

Annotate your results by adding a label.

Test the results. Measure the height of the scones to show how much they have risen. These are my results:

- Plain flour with no raising agent = 2½ cm
- Self Raising flour = 4 cm
- Plain flour + ½ tsp baking powder = 3 cm
- Self Raising flour + ½ tsp baking powder = 5 cm
- Plain flour + ¼ tsp bicarbonate of soda and ¼ tsp cream of tartar = 4 cm

Cut the scones in half, look at the texture and carry out a taste test.



Draw a chart to show the scone heights.
Photograph and use in your report.

To do

Use websites to find out the ingredients for these products. For example, Sainsbury's.
Type the ingredient into the website search bar.

Raising agents	Ingredients listed for product
Self raising flour	
Baking powder	
Bicarbonate of soda	
Cream of tartar	

Scones and chemical raising agents

Taste test

Set up a **fair test** so every sample must be

- The **same** size
- Served in the **same** way at the **same** temperature.

Give the samples random numbers so that the tasters don't know which scone is which.

Tell tasters how to carry out the tasting.
Name the pastries and ask them to score each pastry out of 5 using these Descriptors.
Use your own Descriptors too.

Present results as a **Star Profile**.
Use The Nutrition Program or an Excel sheet to present your results.

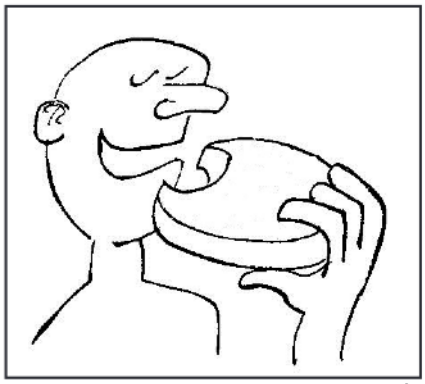
Open The Nutrition Program and go to
My Recipes - name the New Recipe Scones with different raising agents
Star Profile
+ Add Descriptor
Choose **Descriptors** - such as light, well risen, crumbly and solid.
In Add Taster write in the different raising agents used - Plain flour + baking powder, Self Raising flour + baking powder, plain flour + bicarbonate of soda + cream of tartar, Self Raising flour.
Give each **Descriptor** a mark out of 5 where 1 = not, and 5 = very.
So for crumbly, a mark of 1 means the scone is not crumbly and 5 means very crumbly.

Analyse and Evaluate

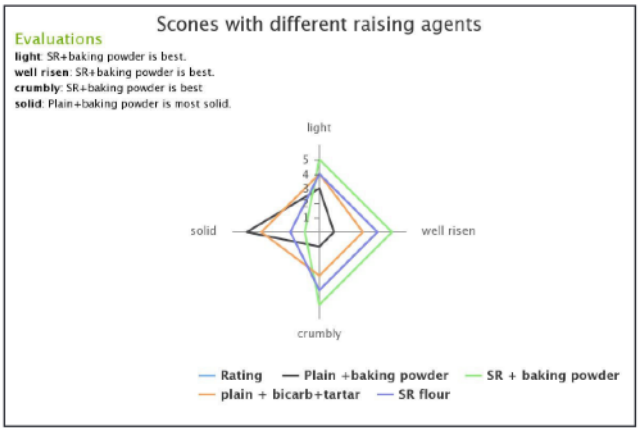
When all the results are in, write the **Evaluations** next to each **Descriptor.**
Export your **Star Profile** as a jpg for your Investigation.
Annotate the **Star Profile** with your comments.
This is part of the **Analysis.**

To do

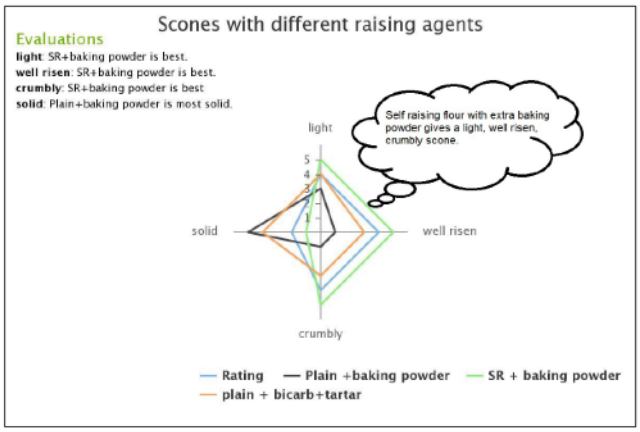
Use the Nutrition Program to complete a Star Profile to practise for a scone tasting.
Export your results and **Annotate** with comments.



Taste your results.



Complete the Evaluations for the scone tasting.



Annotate the Star Profile to explain the results.

Scones and chemical raising agents

Check your List to record results.

Check List to record results	Yes	Not yet	Comments
I have photographed the results.			
I **Annotated** the photographs and other results.			
I've included some charts.			
I've shown **Sensory** testing methods.			
I **Annotated** the **Tasting** results.			
I've shown **Experiment** results.			

Analyse and Evaluate

Interpret the results of the Investigation.

- Sum up and decide on improvements.
- Link **Research** explaining the working characteristics, functional and chemical properties of the ingredients.
- **Evaluate** the **Hypothesis**/prediction with reasons.
- Explain how the results/findings can be used in food preparation and cooking.

(Check exam board)

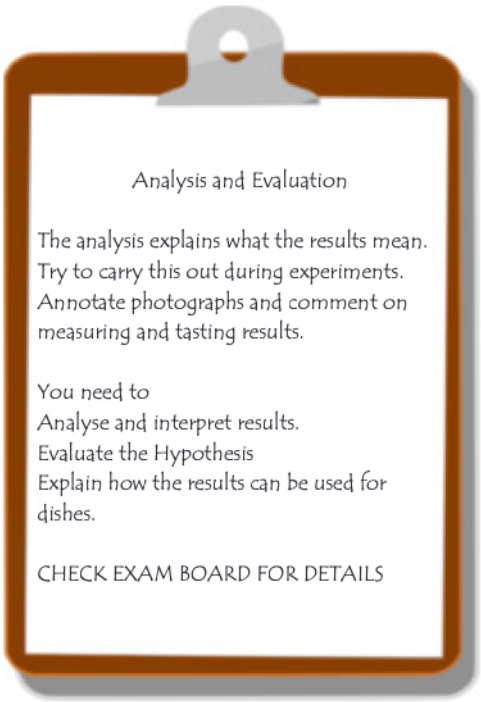
What about the **Hypothesis**?
The **Hypothesis** statement may be proved or disproved. It explores how ingredients work and why.

My **Hypothesis** for the raising agent task *Scones made with the most chemical raising agent - Self Raising flour + baking powder - will make the lightest and best scones.*

This is true as the scones with Self Raising flour + baking powder increased the most in size and had a good texture.
More carbon dioxide gas was produced as self raising flour contains a raising agent, and baking powder is a raising agent. So both of these ingredients reacted, giving off carbon dioxide gas to push up the scone dough and make the most risen scone.

Conclusions

My **Experiments** show that the best scone is made from self raising flour with extra baking powder. More carbon dioxide gas was produced as self raising flour contains a raising agent,



and baking powder is a raising agent. So both of these ingredients reacted, giving off carbon dioxide gas to push up the scone dough and make the most risen scone.
The scone samples needed accurate measurements as I'm working with such small samples.

How can this raising agent Investigation be used for practical cooking?
(Check if exam board needs this)

I can use extra baking powder for recipes that use self raising flour to make lighter, more risen scones and cakes. Mary Berry's fruit scones are made from self raising flour and baking powder!

I know that the raising agents act as soon as I mix in liquid, so scones and cakes must be baked soon after being made to trap the bubbles of **carbon dioxide** gas.

References
List the books, internet, magazines used.

Website	Information
www.fabflour.co.uk	Resources and information on types of flour.
www.dovesfarm.co.uk	Information on raising agents in flour.
www.bbc.co.uk/food	Articles and information.
www.bbc.co.uk/education	BBC Bitesize revision

Scones and chemical raising agents

Extra Nutrition Investigation

Did you know that the **chemical raising agents**, baking powder, bicarbonate of soda and self raising flour all contain high levels of sodium?
We need to lower the amount of sodium chloride - salt - in our diets.
The sodium in **chemical raising agents** also counts as our salt intake.

To do

Nutrition Investigation

Find the amount of sodium in chemical raising agents.

1. Use The Nutrition Program or another **Nutritional Analysis** program to find the amount of sodium in 100g of these raising agents. (8 marks)

Open The Nutrition Program and go to

- My Recipes
- + New Recipe - type in Sodium, Portion 1 - this is just an Investigation.
- Find ingredient - for example, baking powder - you will see the screen Nutrition Amount (per 100g)
- Keep changing the ingredient and you find the answers.

Sodium (Salt) in Raising Agents		
Fat	Amount of Salt in 100g	Amount of Sodium in 100g
Baking powder		
Bicarbonate of soda		
Self raising flour		

1. A scone Nutrition label shows that the scones are high in salt, yet no salt is used in the recipe. Explain this mystery. (2 marks)

Shortcrust pastry - changing the fats

The Task

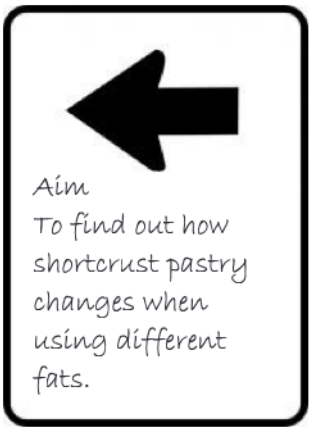
Eduqas Task NEA 1

Shortcrust pastry should be crisp to the bite and crumbly in the mouth. It can be prepared using a range of different ingredients.

Show the shortening properties of fats when making a shortcrust pastry. Which fat produces the best results? Explain why.

Carry out

- Research,
- Investigation,
- Analysis and **Evaluation** for each Task.



Write the Aim of your Investigation.

This chart shows a summary of work for the Task.

Title of the Task	**Investigate** the fats used in shortcrust pastry.
Summary of Research	Look at pastry recipes, find out about fats, list **food science** words, choose **Experiment**s. Write an Aim.
Hypothesis	Some fats make **shorter,** crisper and more crumbly pastry than others.
Plan of action	Make up 4 samples using different fats. Bake, photograph, taste, measure. Fats with higher water content make tougher pastry - **Investigate**.
Experiments	**Experiment** with pastry samples, to test **shortening** properties of fat, using a **fair test**. Make pastry samples with different fats.
Analyse and **Evaluate**	Look closely at the results of **Experiments** comparing pastry samples and interpret what you have found. Comment and explain the results, and **evaluate** the **Hypothesis.**
Conclusions	Compare results to see which is best pastry, and **Evaluate** results.

Research

- Find the ingredients used in shortcrust pastry, especially the different fats
- Find shortcrust pastry recipes
- What is the **food science**?
- What **Experiment**s can I do?

Test, cook, photograph and analyse results.

Shortcrust pastry - changing the fats

Investigate and Experiment

Make pastries with different fats and test results.
The facts
Pastry is made from 3 ingredients: Flour, Fat, Water.
Shortcrust pastry has a ratio of half fat to flour by weight. For 100g flour, use 50g fat.

Fats used in pastry	
Margarine	Margarine contains water and flavouring, and is about 80% fat. The water in margarine develops the gluten in the flour, making a tougher, **less short** pastry.
Butter	Butter is made by churning cream to remove the buttermilk. Butter is 82% fat and is an emulsion of water in oil.
Fat spread	Fat spreads contain 40-80% fat and have so much water in them, they make tough, **less short** pastry.
Lard	Lard is made from pig's fat and makes light, crisp, **short** pastry. Lard is a good **shortening** ingredient due to its plasticity. It is not as popular for pastry making now, because tastes change and people want vegetarian choices or may not eat pork. Lard is 99% fat, and does not develop the gluten.
Vegetable **shortening** like Trex or Cookeen	Vegetable **shortening** is 100% fat and has no taste and makes light, crisp, **short** pastry as it contains no water to develop the gluten.
Vegetable oil	Vegetable oil can be mixed with flour and when baked makes a crisp, tender and flaky pastry.

The food science bit

How ingredients work and why - fats and oils

- Fats and oils are used in pastry to **shorten** the mixture and make it crisp and crumbly in texture.
- When the fat is rubbed into the flour, the fat forms a protective coating around flour particles, stops flour absorbing more water and makes **shorter** pastry.
- Fats such as lard and vegetable **shortening** are low in water and make a shorter, crisp pastry.
- When water is mixed with the flour the **gluten develops** so shortcrust pastry uses very little water to keep it crisp and make shorter pastry.

To do

1. Explain why shortcrust pastry is called shortcrust. (2 marks)
2. Which fats are best at making crisp, shortcrust pastry? (2 marks)

Shortcrust pastry - changing the fats

Key food science words to describe function of fat in pastry		
• Shortening • Gluten	• Plasticity • Dextrinisation	• Emulsification • Evaporate

Experiment

Test the **shortening** properties of fat.
Make 4-5 pastry samples.

Ingredients
500g plain flour
50g of fats to test - butter, margarine, fat spreads, lard, vegetable **shortening**

Sample shortcrust pastry recipe

Ingredients
100g plain flour
50g fat
Cold water to mix

Method

1. Preheat the oven to 200°C/Gas 6.
2. Rub 50g of fat into 100g plain flour until it looks like breadcrumbs. A processor can help.
3. Quickly mix to a dough with cold water - about 1-2 tablespoons.
4. Make each pastry in the same way for the same time.
5. Roll each pastry into an oval or oblong about 2 cm thick and label with the fat used.
6. Use baking parchment to stop the pastry sticking. Make all ovals and oblongs the same size for a **fair test**.
7. Bake all the pastries in the oven for 15 minutes.
8. Remove and cool then photograph and taste the pastries for colour, taste and texture.

Use a food processor for a fair test.

Equipment
4 bowls, scales, food processor, knife, rolling pin, baking tray with non stick baking paper, cooling rack, ruler, oven timer, plates.

Don't roll pastry out too much.

To do

1. Explain what happens if shortcrust pastry is rolled and handled too much.(2 marks)

Shortcrust pastry - changing the fats

Photograph and Annotate

- Take photographs as you work.
- Make notes on how the pastries feel and how easy they are to roll.
- Take photographs of the cooked results.
- Label the pastries for clear results.

Pastry dough made from different fats.

Uncooked pastry dough - rolled to same size

Cooked pastry dough with labels

Annotate the photographs

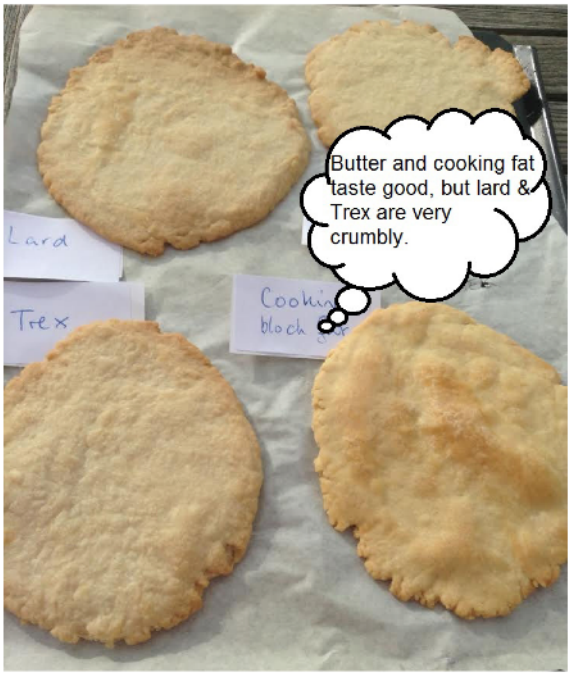
I've used a Callout and written an **Evaluation** inside.

This describes my tasting results.

For example.

- *Pastry made from butter and margarine tastes creamy.*
- *Lard and Trex give really light, crumbly results.*

These comments form part of **Analysis.**

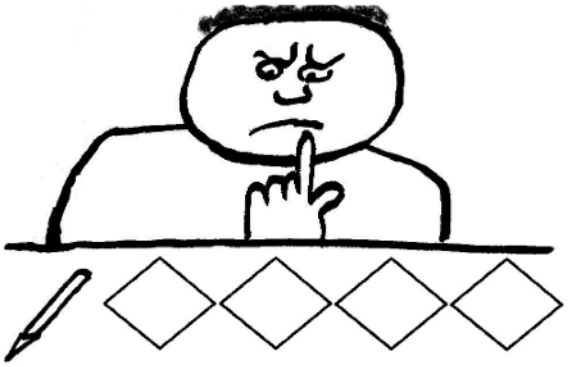


Cooked pastry dough with Annotation

Shortcrust pastry - changing the fats

Analyse and Evaluate

How does it taste?
Taste your pastries and record your results.
Make some Tasting notes of your results.



Taste the pastries in the same way and at the same temperature.

Carry out a Taste test for Sensory Evaluation
Set up a **fair test** so every sample is

- The **same** size
- Served in the **same** way at the **same** temperature.

Tell tasters how to carry out the tasting.
Taste the 4 pastries in the same way and at the same temperature.
I've named them to remember which is which!
Name the pastries and ask them to score each pastry out of 5 using these **Descriptors.**

Use your own Descriptors too. I've used:

- Crisp
- Crumbly
- Flaky
- Hard
- Tasty

***Tasting** notes*

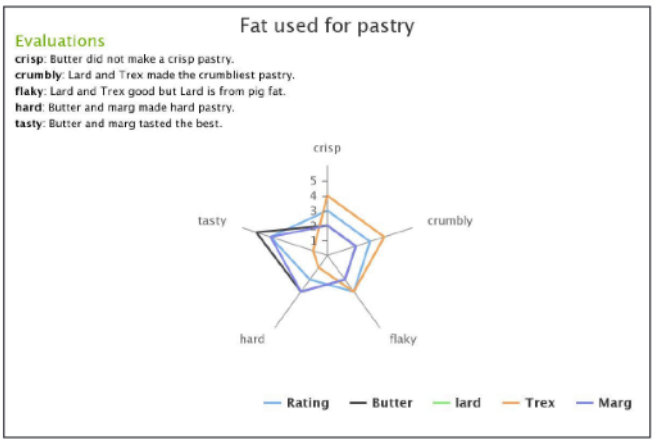
- Butter gives the best flavour,
- Margarine is cheaper to use
- Some baking fats make crisp pastry,
- Lard and Trex make pale, tasteless but light pastry.

Present results as a **Star Profile**
Use **The Nutrition Program** or an Excel sheet.

Open The Nutrition Program and go to

- My Recipes - name the recipe *Fats used for pastry*
- **Star Profile**
- +Add **Descriptor**

Choose **Descriptors** from the Nutrition Program list or use your own.
Give each **Descriptor** a mark out of 5 where 1 = not, and 5 = very.
So for crumbly, a mark of 1 means the pastry is not crumbly and 5 means very crumbly.



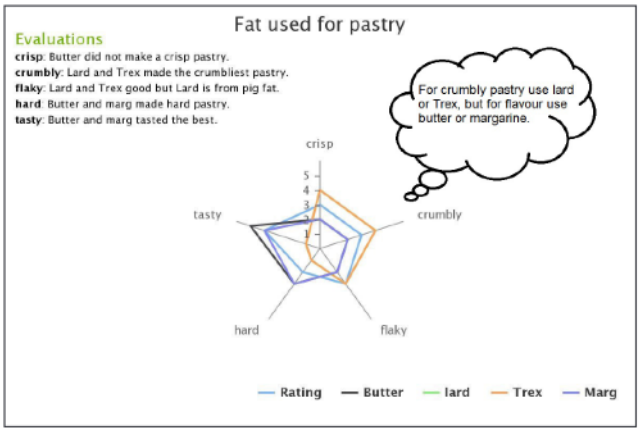
Star Profile with Evaluations for pastry made with different fats.

Type in the fats into Add Taster.
Give each Taster the name of the fat in the pastry.
In this example, I've used butter, lard, Trex and margarine.
Complete the **Evaluation** of each **Descriptor** on the **Star Profile**. Export the image as a jpg to show the **Star Profile** and the **Evaluation** results.
(Continued)

Shortcrust pastry - changing the fats

Star Profile (Continued)

Annotate the **Star Profile** with your comments.
This is part of the **Analysis.**
From your **Experiment**, decide which fat makes the best pastry. Use the **Star Profile** results.



Annotate the Star Profile to explain results.

To do

Use the Nutrition Program and complete a **Star Profile** to practise. Or use an Excel spreadsheet.
Copy the fats listed - butter, lard, Trex and margarine.
Type in the Descriptors - crisp, crumbly, flaky, hard and tasty. Type in the Rating - a mark out of 5 - and complete the **Evaluations.**
Export your work and **Annotate** with comments.

Extra Nutrition Investigation

When you add water to pastry, the **gluten** in the flour develops.
This leads to tougher pastry.
Find out which fats contain the most water.
Fats with a higher water content make tougher pastry.
Lower water fats make crumbly pastry.

To do
Nutrition Investigation

1. Use The Nutrition Program or another **Nutritional Analysis** program to find the amount of fat and water in 100g of 4 fats.
(8 marks)
Open The Nutrition Program and go to

- My Recipes
- + New Recipe - type in Water in fats, Portion 1 - this is just an **Investigation**.
- Find ingredient - for example, butter - you see the screen Nutrition Amount (per 100g)
- Keep changing the ingredient and you find the answers.

Amount of Fat and Water in Fats		
Fat	Amount of fat in 100g	Amount of water in 100g
Butter		
Lard		
Margarine		
Trex vegetable fat		

2. Explain why lard and Trex make crisp, short pastry. (1 mark)

Shortcrust pastry - changing the fats

Analyse and Evaluate

- Interpret the results of the Investigation.
- Sum up and decide on improvements.
- Link **Research** explaining the working characteristics, functional and chemical properties of the ingredients.
- **Evaluate** the **Hypothesis**/prediction with reasons.
- Explain how the results/findings can be used in food preparation and cooking.

(Check exam board)

Check your List to record results.

Check List to record results	Yes	Not yet	Comments
I have photographed the results.			
I **Annotated** the photographs and other results.			
I've included some charts.			
I've shown **Sensory** testing methods.			
I **Annotated** the **Tasting** results.			
I've shown **Experiment** results.			

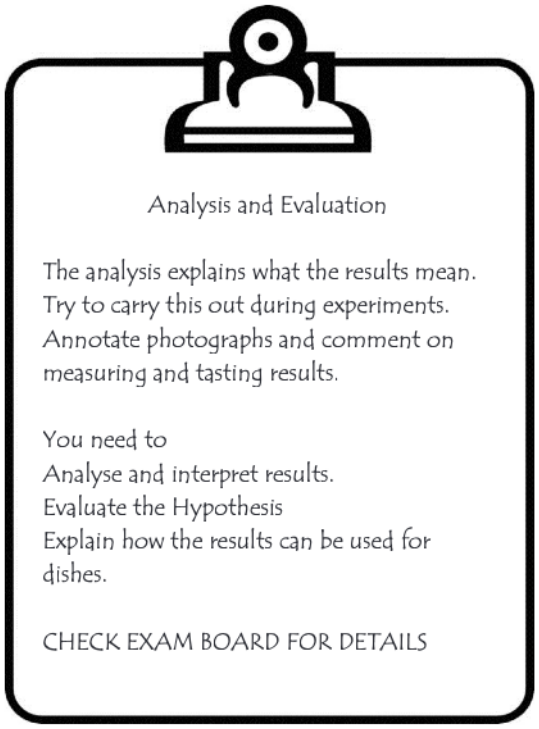
What about the **Hypothesis**?
The **Hypothesis** is a statement which may be proved or disproved.
It explores how ingredients work and why.

My **Hypothesis** for the pastry fats task
Some fats make shorter, crisper and more crumbly pastry than others.

The **Hypothesis** is shown to be true and I found the lard and Trex make the shortest pastries, but people prefer the taste of butter, so a mixture of fats for pastries needs testing. Lard and Trex contain very little water so these fats do not affect the gluten which makes a tough pastry.

How can this Investigation into fats in shortcrust pastry be used for practical cooking?
(Check if exam board needs this.)

- This experiment helps with the choices of fats in pastry, and I might decide to mix ones which give a short pastry (lard and Trex) with those that give flavour (butter and margarine). This will give a crisp, tasty pastry.
- But, if serving pastry to vegetarians, I can't use lard as it comes from animal fat.



Conclusions

The investigation of making and baking the pastries showed how the fats gave different colours, tastes and textures to the pastries.
I needed to do more **Experiments** and mix up the fats to combine flavour and shortening.
I could also investigate the fats designed for baking to see their results.
More experimental work was needed for this Task and I haven't investigated plasticity of fats.

Website	Information
www.bbc.co.uk/food	Articles and information.
www.bbc.co.uk/education	BBC Bitesize revision.
www.bakewithstork.com	Look at Baking Dictionary.
www.trex.co.uk	Facts on Trex.
www.dairycrest.co.uk	Range of fats.

References
List the books, internet, magazines used.

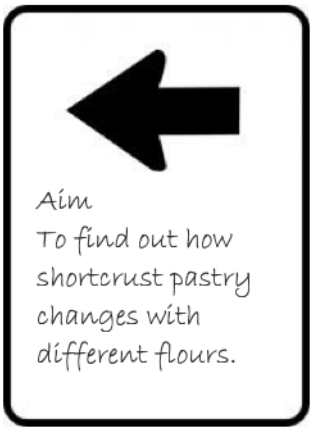
Shortcrust pastry - changing the flour

The Task

- *Shortcrust pastry should be crisp to the bite and crumbly in the mouth. It can be prepared using a range of different ingredients.* ***Investigate*** *the working characteristics, functional and chemical properties, of the different ingredients needed to achieve a perfect shortcrust pastry.*

Or

- ***Investigate*** *what type of flour is best for shortcrust pastry.*



Write the Aim of your Investigation.

Carry out

- Research,
- Investigation,
- Analysis and **Evaluation** for each Task.

Research

- Find shortcrust pastry recipes
- Find different flours to use
- What is the science?
- What **Experiments** can I do?

This chart shows a summary of work for the Task.

Title of the Task	**Investigate** the flour used in pastry
Summary of Research	Look at pastry recipes, find out about flours, list science words, choose **Experiments**. Write an Aim.
Hypothesis	Plain flour is used for shortcrust pastry, so it must be the best choice.
Plan of action	Experiment with gluten ball and compare the amount of gluten in flours. Make up 4 gluten ball samples using different flours. Make up 4 shortcrust pastry samples. Bake, photograph, taste, measure.
Experiments	Gluten ball Experiment. Compare flours in pastry samples.
Analyse and Evaluate	Look closely at the results of **Experiments** showing gluten in flours and interpret what you have found. Comment and explain the results, and **evaluate** the **Hypothesis**.
Conclusions	Compare gluten ball results to see which contains the most gluten, and **Evaluate** results. Explain how the different pastries look, taste and feel.

Shortcrust pastry - changing the flour

The food science bit

Key science words to describe function of flour in pastry		
• Gluten • Protein	• Coagulation • Dextrinisation	• Structure • Low gluten

- Wheat flour is made of **starch** and contains the protein, **gluten**.
- **High gluten** flours such as bread flours hold the structure of breads and yeast doughs.
- If you stretch or roll out dough it **stretches** the **gluten** which leads to a tough pastry.
- Pastries and cakes need **lower gluten flours** as they give a less tough result and a softer bake.
- **Starch** in pastry changes colour in dry heat. Pastry changes colour when baked. This is called **dextrinisation.**

Gluten in flour stretches when you work a wheat flour dough.

Types of flour	Description	Uses
White plain flour	Usually contains around 75% of the wheat grain. Most of the bran and wheatgerm have been removed during the milling process.	Biscuits and shortcrust pastry.
Brown flour	Usually contains about 85% of the original grain. Some bran and germ have been removed.	Breads, cakes and biscuits.
Wholemeal flour	Made from the whole wheat grain with nothing added or taken away.	Breads, cakes and biscuits.
Self raising flour	Plain flour with raising agent added. Low in gluten.	Cakes, scones, biscuits.
Strong flour	Flour with a higher gluten content made from hard wheat.	Breadmaking, choux and filo pastry.
Rye flour	Flour made from rye cereal.	Dark, chewy bread.

To do

1. Choose a flour that you would use to make the following baked goods. Give a reason for your choice.

(2 marks for each answer.)

a) bread

b) cakes

c) choux pastry.

Shortcrust pastry - changing the flour

Investigate *what type of flour is best for shortcrust pastry making.*

Investigate and Experiment

- Make some gluten balls
- Make pastry with different flours and test results.

Experiment - Gluten balls

- **Gluten** is a protein found in wheat flour which forms the structure of bread, cakes and biscuits.
- Different types of flour have different amounts of **gluten**.
- Very strong bread flour has lots of **gluten**.
- Cake making flour such as self raising flour is lower in **gluten**.

In this **Experiment starch** is washed out of the **gluten** ball.
When the **gluten** ball is baked, the water evaporates, pushing up the **gluten** which coagulates, crisps and sets, forming the structure.

Make a gluten ball - Sample gluten ball recipe

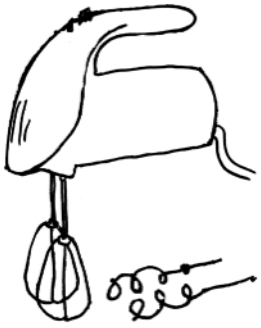
Electric beater with dough hooks or use your hands, bowl of water, muslin, baking tray lined with non stick parchment paper, sieve.

Ingredients

150g of each flour:
Strong, bread flour, Self raising flour, Plain flour, Rye flour
Water to mix

Method

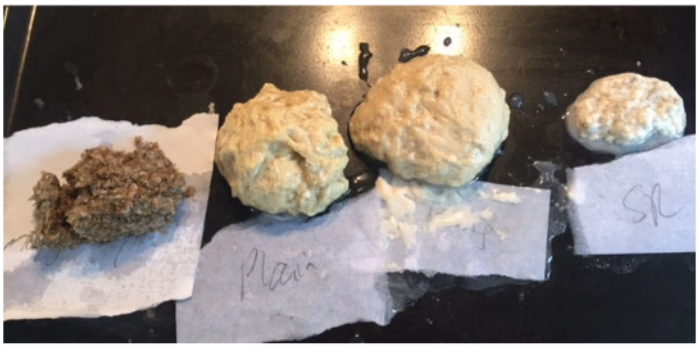
1. Preheat the oven to 200°C/Gas 6. Line the baking tray with paper.
2. In a bowl mix flour to a soft dough with 6-8 tablespoons of water.
3. Beat with dough hooks until smooth and use your hands to form a ball.
4. Put the dough in a bowl of water and squeeze the mixture so that the **starch** washes out. The water turns white.
5. Or put the ball in a strong Jcloth or muslin, tied with string. Low **gluten** flours contain little gluten so are difficult to wash.
6. Repeat with clean water and wash until you have a springy ball that looks like beige chewing gum.
7. Repeat with the other flours. Weigh the gluten balls and record results.
8. Put the balls on the baking tray and bake 15-25 minutes until puffed and golden.
9. Water evaporates as steam and pushes up the gluten to form the structure which sets.
10. Photograph the cooked **Gluten** balls for your results.



Shortcrust pastry - changing the flour

Photograph the Experiment results

Label the **gluten** balls before baking.
See how low **gluten** flours like rye and self raising flour make small **gluten** balls.
Weigh before baking.



Uncooked gluten balls

Photograph the **gluten** balls when they are baked.
See how the flours which contain more **gluten** such as the plain and strong flours, puff up and make large **gluten** balls.

Cooked gluten balls

Analyse and Evaluate

Annotate the photograph to explain the results. You can do this with a **Callout.**

Annotate the results of the experiment

The food science bit

What happens when the **gluten** ball is cooked?

- The water in the **gluten** ball evaporates, and steam pushes up the **gluten**.
- The **gluten** protein sets (coagulates) and forms the structure.
- The **gluten** changes colour due to a Maillard browning reaction.

My results
Rye flour has a very low **gluten** content - I couldn't wash the ball any more so this looks like bran!

I expected strong flour and plain flour to make different **gluten** balls but these results look the same.

Self raising flour is low **gluten** so it hardly made a ball.

Shortcrust pastry - changing the flour

Investigate and Experiment

Test the properties of flour in shortcrust pastry.
Make 4 pastry samples
Chose 50g of 4 flours - plain, self raising, bread flour, rye flour ...
You need 200g margarine for the 4 samples

Use a food processor to mix pastry - mix pastries for the same time.

Sample Shortcrust Pastry Recipe

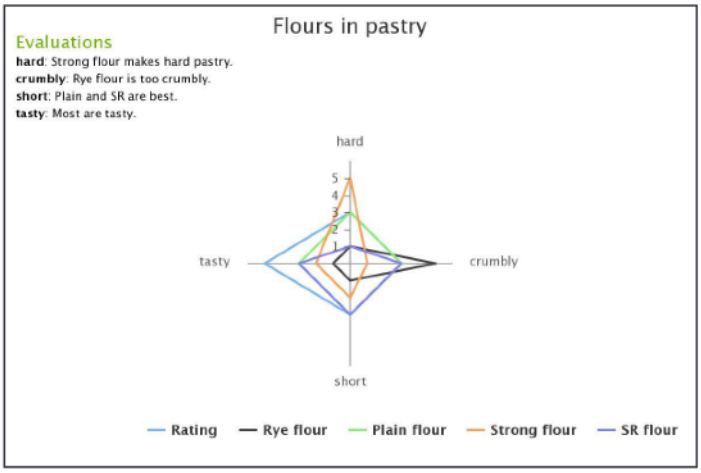
Ingredients
100g flour
50g fat - for example, margarine
Cold water to mix - 1-2 tablespoons

Method

1. Preheat the oven to 200°C/Gas 6.
2. Rub 50g of fat into 100g plain flour until it looks like breadcrumbs. A processor can help.
3. Quickly mix to a dough with cold water - about 1-2 tablespoons - to form a dough.
4. Roll each pastry into an oval or oblong about 2 cm thick and label it with the fat used. Use baking parchment to stop the pastry sticking. Make all ovals or oblongs the same size for a **fair test**.
5. Bake all the pastries in the oven for 15 minutes.
6. Remove and cool then taste the pastries for colour, taste and texture.

Equipment
4 bowls, scales, food processor, knife, rolling pin, baking tray with non stick baking paper, cooling rack, ruler, oven timer, plates.

Rolling out pastry stretches the gluten and makes pastry tougher.



Complete a Star profile of tasting the pastries

Shortcrust pastry - changing the flour

Analyse and Evaluate
How does it taste?
Taste your pastries and record your results.
Make some Tasting notes of your results.

Carry out a Taste test for Sensory Evaluation
Set up a **fair test** so every sample is

- The **same** size
- Served in the **same** way at the **same** temperature.

Tell tasters how to carry out the tasting.
Taste the 4 pastries in the same way and at the same temperature.
Name the pastries and ask them to score each pastry out of 5 using these **Descriptors.**
Use your own Descriptors too

- Hard
- Crumbly
- Short
- Tasty

Present results as a **Star Profile**
Use **The Nutrition Program** or an Excel sheet to present your results.

Open The Nutrition Program and go to

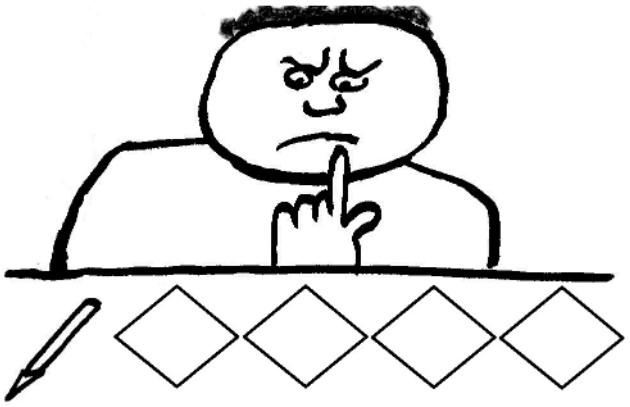
- My Recipes - name the recipe *Flours in pastry*
- **Star Profile**
- +Add **Descriptor**

Choose Descriptor words from the Nutrition Program list like crumbly, short, tasty, hard or use your own.

***Tasting** notes*

- *Plain wheat flour makes a short, crumbly, tasty pastry.*
- *Rye flour pastry tastes nutty but it's really crumbly and won't roll.*
- *Strong flour makes a tough, hard pastry because it is so high in gluten, so should not be used for shortcrust.*
- *Self raising flour is low in gluten and has a raising agent so it makes a soft, spongy pastry which falls to bits.*

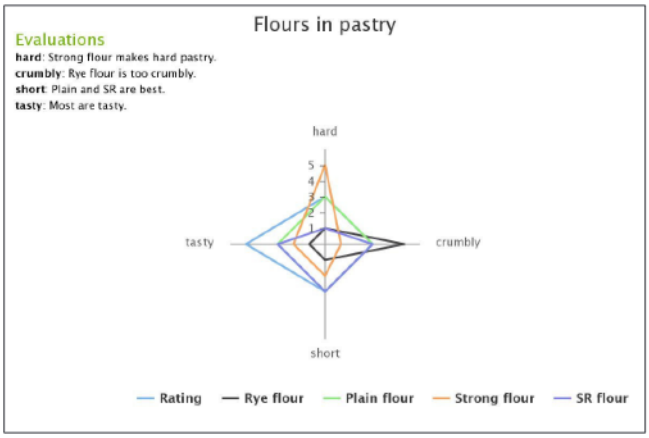
Make some Tasting notes of your results.



Choose tasting words for pastry (Descriptors).
Give each Descriptor a mark out of 5.

Pastry tasting for flour

Taste the 4 samples
Mark out of 5 where
5=very and taste if
Hard
Crumbly
Short
Tasty



Star Profile with results of tasting and Evaluations.

Shortcrust pastry - changing the flour

Star Profile (Continued)
Type the flours into Add Taster.
Give each Taster the name of the flour in the pastry. In this example, I've used rye, plain, strong and self raising flour.
Present results as a **Star Profile.**

Carry out the tasting
Give each **Descriptor** a mark out of 5 where 1 = not, and 5 = very.
So for crumbly, a mark of 1 means the pastry is not crumbly and 5 means very crumbly.
Taste all the pastries and compare the results with a mark out of 5.
Export your Star Profile for your Investigation.

Annotate the **Star Profile** with your comments.
This is part of the **Analysis.**

Analysis and Evaluation

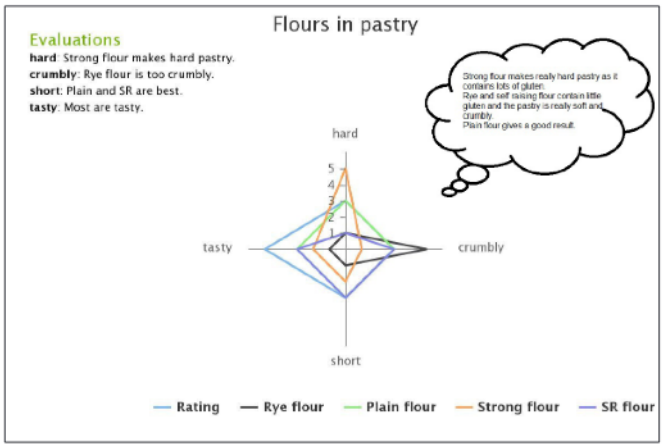
- Interpret the results of the Investigation.
- Sum up and decide on improvements.
- Link **Research** explaining the working characteristics, functional and chemical properties of the ingredients.
- **Evaluate** the **Hypothesis**/prediction with reasons.
- Explain how the results/findings can be used in food preparation and cooking.

(Check exam board)

What about the **Hypothesis?**
The **Hypothesis** is a statement which may be proved or disproved. It explores how ingredients work and why.

My Hypothesis for the flour in pastry task
Plain flour is used for shortcrust pastry, so it must be the best choice.

- The experiment results show that plain flour made the best shortcrust pastry, but plain and strong flour made same gluten balls.
- Plain flour should contain less gluten than strong flour so the pastry should not be as tough as gluten forms the strong structure.
- Yet the gluten balls were similar in size.
- The plain flour made the best pastry though, and the strong flour made tough pastry.



Annotate the Star Profile with comments.

Analysis and Evaluation

The analysis explains what the results mean.
Try to carry this out during experiments.
Annotate photographs and comment on measuring and tasting results.

You need to
Analyse and interpret results.
Evaluate the Hypothesis
Explain how the results can be used for dishes.

CHECK EXAM BOARD FOR DETAILS

To do

Use the Nutrition Program and complete a **Star Profile** to practise.
Copy the flours listed - rye, plain, strong and Self Raising flour - or use your own.
Type in the Descriptors - crisp, crumbly, short and tasty. Or use your own.
Type in the Rating - a mark out of 5 - and complete the **Evaluations.**
Export your work and **Annotate** with comments.

Shortcrust pastry - changing the flour

Complete the Check List to record results.

Check List to record results	Yes	Not yet	Comments
I have photographed the results.			
I **Annotated** the photographs and other results.			
I've included some charts.			
I've shown **Sensory** testing methods.			
I **Annotated** the **Tasting** results.			
I've shown **Experiment** results.			

How can this Investigation into flours in shortcrust pastry be used for practical cooking?
(Check if exam board needs this.)

This will help to decide which flours to use for pastries and which ones to avoid.
Strong, bread flours won't make good shortcrust pastry.
Soft flours also make pastry which is too crumbly.

Conclusions

This Investigation shows that some flours are difficult to use for shortcrust pastry because they have a high or low **gluten** content.

Higher **gluten** flours such as bread flour are better for other pastry like flaky or choux.
Lower **gluten** flours such as self raising flour make a crumbly pastry that falls to bits, so they are used for cakes.

Plain flour is used for shortcrust pastry, so it must be the best choice. High **gluten** flours such as bread flour make tougher pastry.

References
List the books, internet, magazines used.

Website	Information
www.grainchain.com	Resources and information on gluten content of flours
www.fabflour.co.uk	Resources and information on types of flour.
www.dovesfarm.co.uk	Information on flours.
www.foodafactoflife.org.uk	Information on **food science**.

Bread - changing the flour

The Task

Investigate *what type of wheat flour is best for bread.*

Carry out

- Research,
- Investigation,
- **Analysis** and Evaluation for each Task.

Research

- Find bread and recipes
- Find different flours to use
- What is the science?
- What **Experiments** can I do?

Write the Aim of your Investigation.

This chart shows a summary of work for the Task.

Title of the Task	**Investigate** the flour used in breadmaking
Summary of Research	Look at bread recipes, find out about flours, list science words, choose **Experiments**. Write an Aim.
Hypothesis	Strong flour is used for bread making as it contains the most gluten which is needed for bread structure and makes the best choice.
Plan of action	Experiment with gluten balls and compare the amount of gluten in flours. Make up 4 gluten ball samples using different flours. Make up 4 bread samples. Bake, photograph, taste, measure.
Experiments	Gluten ball Experiment. Compare flours in bread samples.
Analyse and Evaluate	Look closely at the results of **Experiments** showing gluten in flours and interpret what you have found. Comment and explain the results, and **Evaluate** the **Hypothesis**.
Conclusions	Compare gluten ball results to see which contains the most gluten, and **Evaluate** results. Explain how the different breads look, taste and feel.

Bread - changing the flour

The food science bit

Key science words to describe function of gluten in bread		
• Gluten	• Coagulation	• Structure
• Protein	• Elasticity	• Gliadin
• Kneading	• Glutenin	• Cross links

- Wheat flour contains **starch** and the proteins, **gliadin and glutenin**.
- Bread needs a **high gluten flour.**
- Kneading the dough makes the 2 proteins combine to form a stretchy **gluten** matrix.
- Bread changes colour during baking due to the Maillard reaction.

Types of flour	Description	Average gluten content	Uses
White plain flour	Usually contains around 75% of the wheat grain. Most of the bran and wheatgerm have been removed during the milling process.	7.5-9% gluten	Cakes and biscuits.
Self raising flour	This is a soft wheat flour with a raising agent added - baking powder	7.5-9%	Cakes and biscuits
Strong flour	Flour with a higher gluten content made from hard wheat.	12-14%	Bread and pasta
00 Pasta flour	This flour has been ground to make it very fine and 00 flour contains a high protein content.	13-14%	Bread and pasta
Very strong flour	This flour has a higher protein content and gluten strength than strong flour.	13-14%	Bread and pasta.

Bread - changing the flour

Functional and chemical properties of gluten

What is gluten?

- **Glutenin** and **gliadin** are proteins in the flour
- Gluten is a protein formed when water is mixed with wheat flour.

The chemistry

- The proteins **glutenin** and **gliadin** form chemical bonds called **cross links** and stick together to form gluten. They interact when wet - when liquid is added to the flour.
- As the dough is mixed, kneaded and rolled more **cross links** form to make a network.
- Kneading makes the gluten stronger, more elastic and stretchable.
- When the gluten is heated, when baking a gluten ball or bread in an oven, gas and steam push up dough and the gluten structure stretches.
- When the gluten ball or loaf of bread are baked, the gluten **coagulates** and sets, forming the structure.

Gluten in flour stretches when you work a flour and water dough. Don't make the dough too wet.

Things that affect gluten development

- Type of wheat - soft wheat used for cakes forms less gluten. Hard wheat used for bread and pasta has more protein and forms stronger more elastic gluten structures.
- Water is needed to develop gluten. If dough is too dry, less gluten is developed.
- Kneading the dough stretches the gluten and makes it more elastic
- Resting the dough lets **enzymes** develop the flour mixture which becomes softer and the dough extends more.
- Salt strengthens gluten.
- Fats and oils reduce gluten development.
- Sugar reduces gluten development.

To do

1. Find out the protein content for 100g of the following flours: (4 marks)

Flours	protein /100g
white plain flour	
strong flour	
00 pasta flour	
very strong flour	

Use a Nutrition **Analysis** program to help.

2. Which flour would you choose for a) breadmaking, b) pasta making?
Give a reason for each choice. (4 marks)
3. Explain what happens to the proteins when flour is mixed with water. (3 marks)

Bread - changing the flour

Investigate and Experiment

- Make some gluten balls
- Make bread with different flours and test results.

Experiment - Gluten balls

In this **Experiment starch** is washed out of the flour dough to make a **gluten** ball.
When the **gluten** ball is baked, the water evaporates, pushing up the **gluten** which coagulates, crisps and sets, forming the structure.

Make a gluten ball

Ingredients
150g of each flour:
Strong bread flour, Plain flour, Pasta flour, Very strong flour
Water to mix
(I've chosen 4 flours but check exam board for number needed.)

Method

1. Preheat the oven to 200°C/Gas 6. Line the baking tray with non stick parchment paper.
2. In a bowl mix one flour to a soft dough with 6-8 tablespoons of water.
3. Beat with dough hooks and/or use your hands to form a ball.
4. Knead for 1-2 minutes to make it smooth.
5. Wrap in clingfilm and let the dough rest for 10 minutes.

Electric beater with dough hooks or use your hands, bowl of water, muslin, baking tray lined with non stick parchment paper, sieve.

6. Put the dough ball in fine sieve in a bowl of water and squeeze the mixture so that the **starch** washes out. The water turns white. Watch out though as bits of dough fall out so put them back into the ball.
7. **Or** put the ball in a muslin cloth or strong Jcloth, and tie with string - this gives more accurate results.
8. Lower **gluten** flours contain little gluten so are difficult to wash.
9. Repeat with clean water and wash until you have a springy ball that looks like beige chewing gum.
10. Repeat with the other flours. Label the gluten balls and **weigh** the gluten balls and record results.
11. Put the balls on the baking tray and bake 10-15 minutes until puffed and golden.
12. Water evaporates as steam and pushes up the gluten to form the structure which sets.
13. Photograph your cooked **gluten** balls for your results.

Photograph the baked gluten balls

Record results as the weight of each gluten ball. Find protein/100g in each flour used.

Flours	Protein/100g	Gluten ball weight
plain	9.7g	42g
strong	11g	60g
00 pasta	11g	37g
very strong	14g	70g

Bread - changing the flour

Investigate and Experiment

Test the properties of the flours in breadmaking. Make 3-4 small loaves of bread then bake and taste test them.
Choose 3-4 flours such as

- Strong
- Very strong
- Plain
- 00 Pasta flour

My tip

- Work with small amounts of flour (150g) to make each loaf.
- Shape the dough into a round ball - make each the same size.

Small Bread Loaf Recipe
Ingredients
150g flour - strong, very strong, pasta, plain
1/2 packet dried yeast (4g)
100ml warm water.

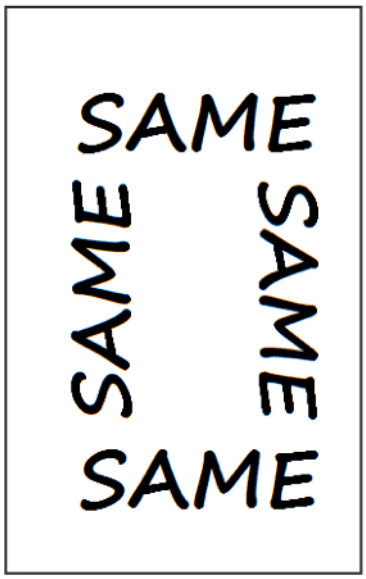
Method

1. Preheat the oven to 220°C/Gas 7.
2. Put the flour and yeast into a bowl and work in the warm water with your hands. Add more water if needed but measure it.
3. Turn out the dough onto a lightly floured surface and knead for 5 minutes.
4. Put the dough in a bowl, cover and leave in a warm place to rise for 20 minutes.
5. Make the other flours into a dough and leave to prove in the same way. All dough balls must be made the same way and proved for the same time.
6. When the 1st dough has risen, shape into a ball and place on a baking tray lined with baking parchment. Cover with oiled cling film and let it rise for 5 more minutes.
7. Make the other dough balls into the same size for a **fair test**.
8. Bake each bread dough in the oven for 20 minutes until crisp and golden.
9. Knock the bottom of the loaf to see if sounds hollow - if not bake some more.
10. Remove, cool, photograph and **evaluate** the breads for colour, taste and texture.

The food science bit

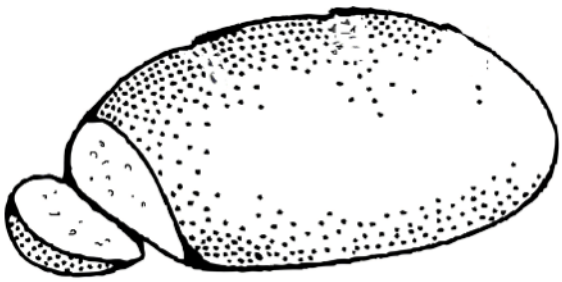
What happens when the **gluten** ball is cooked?

- The water in the **gluten** ball evaporates, and steam pushes up the **gluten**.
- The **gluten** protein sets (coagulates) and forms the structure.
- The **gluten** changes colour due to a **Maillard** browning reaction.



Make sure you make each loaf the same

- Same weight of ingredients
- Knead for the same time
- Prove for the same time
- Shape the same size
- Bake for the same time
- Taste and **evaluate** the same.



Loaves must be shaped to the same size.

Bread - changing the flour

Analyse and Evaluate
How does the bread look and taste?
Taste your breads and record your results.
Make some Tasting notes of your results.

Carry out a Taste test for Sensory Evaluation
Set up a **fair test** so every sample is

- The **same** size
- Served in the **same** way at the **same** temperature.

Tell tasters how to carry out the tasting.
Taste the 4 breads in the same way and at the same temperature.
Name the breads and ask them to score each bread out of 5 using **Descriptors.**
Choose your own Descriptors

- Firm dough
- Light texture
- Firm crust
- Well risen

Present results as a **Star Profile**
Use **The Nutrition Program** or an Excel sheet to present your results.

Open The Nutrition Program and go to

- My Recipes - name the recipe *Flours in pastry*
- **Star Profile**
- +Add **Descriptor**

Choose Descriptor words from the Nutrition Program list like firm, light, well risen or use your own.

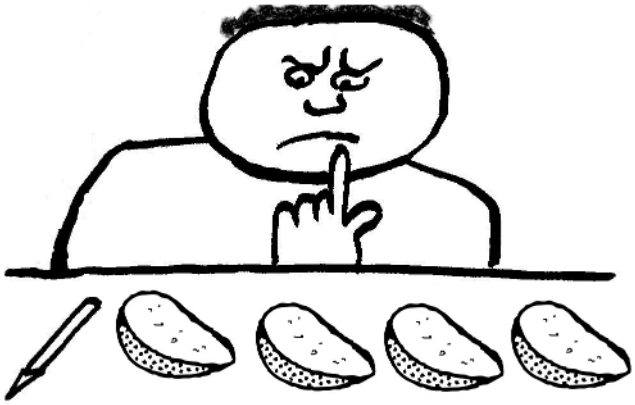
Bread tasting for flour

Taste the 4 samples
Mark out of 5 where
5=very and taste if
Firm
Light
Firm crust
Well risen

***Tasting** notes*

- *Plain flour does not rise enough.*
- *Strong flour is high in gluten, so makes good bread*
- *Pasta flour is high in gluten and this makes good bread too!*
- *Very strong flour made good bread which rose the most.*

Make some Tasting notes of your results.



Choose tasting words for breads (Descriptors).
Give each Descriptor a mark out of 5.

Flours	firm dough	light texture	firm crust	well risen	Height of bread
Strong	3	3	4	4	6cm
Very strong	4	3	5	5	5cm
Pasta 00	3	4	4	5	5cm
Plain	4	2	4	3	4cm

Record results as chart or graph.

Bread - changing the flour

Star Profile (Continued)
Type the flours into Add Taster.
Give each Taster the name of the flour. In this example, I've used strong, very strong, pasta 00, plain. Present results as a **Star Profile.**

Carry out the tasting
Give each **Descriptor** a mark out of 5 where 1 = not, and 5 = very.
So for light texture, a mark of 2 means the bread is not very light and 5 means very light.
Taste all the breads and mark out of 5.
Export your **Star Profile** for your Investigation.

Evaluate and annotate the **Star Profile** with your comments. This is part of the **Analysis.**

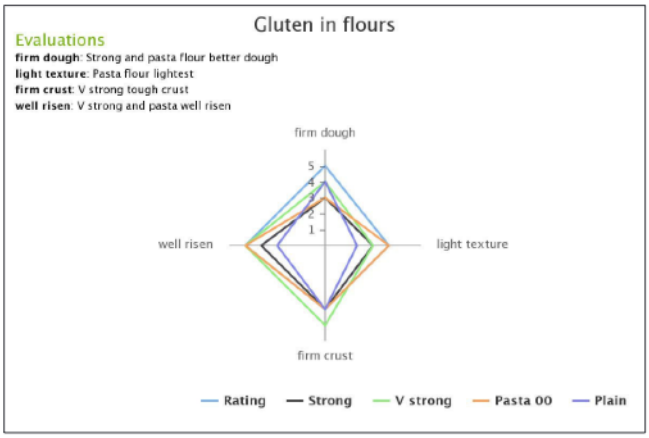
Analysis and Evaluation
- Interpret the results of the Investigation.
- Sum up and decide on improvements.
- Link **Research** explaining the working characteristics, functional and chemical properties of the ingredients.
- **Evaluate** the **Hypothesis**/prediction with reasons.
- Explain how the results/findings can be used in food preparation and cooking.

(Check exam board)

What about the **Hypothesis**?
The **Hypothesis** is a statement which may be proved or disproved. It explores how ingredients work and why.

My Hypothesis for the flour in bread task
Strong flour is used for bread making as it contains the most gluten which is needed for a good bread structure.

- My experiment results show that strong, very strong and pasta flour make the best breads but the gluten balls didn't show the same results.
- Plain flour contains less gluten than strong flour so the bread did not rise as much.
- Higher gluten forms the firm structure.
- Yet the gluten balls were similar in size.



Evaluate the Star Profile with comments.

Analysis and Evaluation

The analysis explains what the results mean.
Try to carry this out during experiments.
Annotate photographs and comment on measuring and tasting results.

You need to
Analyse and interpret results.
Evaluate the Hypothesis
Explain how the results can be used for dishes.

CHECK EXAM BOARD FOR DETAILS

To do

Use the Nutrition Program and complete a **Star Profile**.
Or you can create a radar chart on Excel.
Copy the flours listed or use your own.
Type in the Descriptors or use your own.
Type in the Ratings - a mark out of 5 - and complete the **Evaluations.**
Export your work and **Annotate** with comments.

Bread - changing the flour

Complete the Check List to record results.

Check List to record results	Yes	Not yet	Comments
I have photographed the results.			
I **Annotated** the photographs and other results.			
I've included some charts.			
I've shown **Sensory** testing methods.			
I **Annotated** the **Tasting** results.			
I've shown **Experiment** results.			

How can this Investigation into gluten in bread be used for practical cooking?
(Check if exam board needs this.)

This will help to decide which flours to use for bread and which ones to avoid.
Strong, bread flours make good bread.
Soft flours do not contain enough gluten so are not used.

Conclusions

This Investigation shows that some flours are best to use for bread because they have a high **gluten** content.

Higher **gluten** flours such as bread flour are better for bread.
Lower **gluten** flours such as self raising flour are used for cakes.

References
List the books, internet, magazines used.

Website	Information
www.grainchain.com	Resources and information on gluten content of flours
www.fabflour.co.uk	Resources and information on types of flour.
www.dovesfarm.co.uk	Information on flours.
www.foodafactoflife.org.uk	Information on **food science**.

Pasta - changing the flour

The Task
Investigate *what type of wheat flour is best for pasta*

Carry out
- Research,
- Investigation,
- **Analysis** and Evaluation for each Task.

Research
- Find pasta recipes
- Find different flours to use
- What is the science?
- What **Experiments** can I do?

Write the Aim of your Investigation.

This chart shows a summary of work for the Task to investigate pasta

Title of the Task	**Investigate** the flour used in pasta
Summary of Research	Look at pasta recipes, find out about flours, list science words, choose **Experiments**. Write an Aim.
Hypothesis	Flours high in gluten are used for pasta making as they make a firm pasta which can be cut into shapes and stay chewy when cooked.
Plan of action	Experiment with gluten ball and compare the amount of gluten in flours. Make up 4 gluten ball samples using different flours. Make up 4 pasta samples. Cook, photograph, taste.
Experiments	Gluten ball Experiment. Compare flours in pasta samples.
Analyse and **Evaluate**	Look closely at the results of **Experiments** showing gluten in flours and interpret what you have found. Comment and explain the results of the cooked pasta and **evaluate** the **Hypothesis**.
Conclusions	Compare gluten ball results to see which contains the most gluten, and **Evaluate** results. Explain how the different pastas look, taste and feel.

Pasta - changing the flour

Key science words to describe function of gluten in pasta		
• Gluten	• Coagulation	• Glutenin
• Protein	• Elasticity	• Gliadin
• Kneading	• Stretching	• Cross links

The facts

- High gluten flours make a firm dough which makes a chewy pasta.
- Gluten helps with the plasticity and elasticity of the dough.
- Higher gluten flours can stretch and extend when rolled and folded during pasta making.
- Higher gluten flours are easier to knead and roll smoothly either by hand or by pasta machine.

Flours used for pasta

- Recipes use all kinds of flour for fresh pasta - strong, very strong, 00 and plain.
- 00 pasta flour is very finely ground form hard wheat and high in protein.

Fresh pasta is usually made from egg and flour.
The egg has 3 functions

1. To give colour to the pasta dough
2. To add extra protein to the pasta - protein coagulates during cooking
3. To help the dough stick together.

To do

1. What type of flour can be chosen for fresh pasta? Give reasons for your choice. (2 marks)
2. Explain why pasta dough is kneaded and rolled. (2 marks)
3. What changes happen to pasta when it is boiled in water? Explain the science. (2 marks)

Pasta facts

Traditionally, durum wheat is used for pasta.

- Durum is Latin for hard.
- Pasta should be cooked 'al dente' which means 'of the tooth' - slightly chewy.

As freshly made pasta cooks, the starch softens and egg proteins and gluten coagulate and set.

Pasta - changing the flour

Investigate and Experiment

- Make some gluten balls
- Make pasta with different flours and test results.

A gluten ball is made by mixing different flours with water. Knead to a dough then wash out the **starch** from the **gluten** ball.
When the **gluten** ball is baked, the water evaporates, pushing up the **gluten** which coagulates, crisps and sets, forming the structure.
See previous pages for details.

1. Choose flours such as strong, pasta flour and plain flour to compare the gluten.
2. Measure the size of each gluten ball and weigh them.
3. Bake the gluten balls in the oven until golden and crisp. The larger the gluten ball the more gluten is found in that flour.

Gluten balls are different sizes when the flour doughs have the starch washed out.

The food science bit

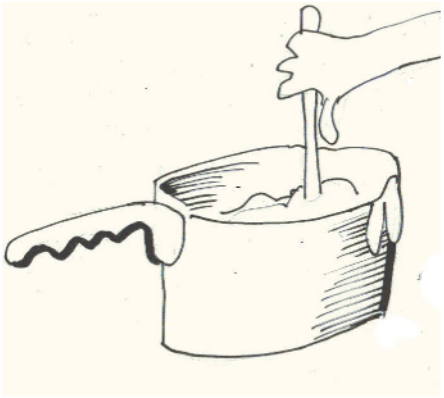
What happens when the **gluten** ball is cooked?

- The water in the **gluten** ball evaporates, and steam pushes up the **gluten**.
- The **gluten** protein sets (coagulates) and forms the structure.
- The **gluten** changes colour due to a **Maillard** browning reaction.

Properties of pasta
Pasta dough should be stretchy but not sticky. This means it can be easily cut into shapes such as noodles. The gluten in the flour gives this elasticity.

What happens when pasta is cooked?
During cooking the starch and the protein in the pasta absorb water.
Some of the starch leaks out into the cooking water which turns white and cloudy.
The gluten in the pasta coagulates with heat and the egg protein also coagulates.
The centre of the pasta is slightly chewy, called 'al dente', as the starch is not completely softened.

Pasta noodles need stirring during cooking. If the noodles touch, the starchy outside surface glues them together.



When the noodles are drained the starchy surface can still stick, so they need to be rinsed in water.
Egg pasta must be cooked immediately or put in the fridge and used quickly to prevent bacteria from growing.

Pasta - changing the flour

Investigate and Experiment

Test the properties of the flours for pasta making.
Choose 3-4 flours - check exam board needs

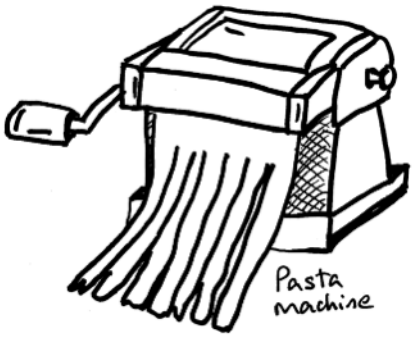
- Strong
- Very strong
- Plain
- 00 Pasta flour

The aim is to make 3-4 lots of pasta noodles, then boil in water and taste test them.
My tip - make a small amount of pasta and cover with clingfilm when made or it will dry out.

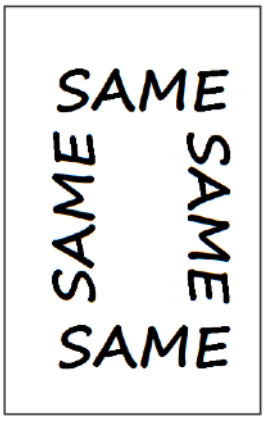
Pasta Ingredients
100g flour - strong, very strong, pasta, plain
1 egg
1-2 tbs water.

Method

1. Put the flour, egg and water in a food processor bowl and whizz to make a dough.
2. If the mixture does not form a ball, take it out and work it with your hands.
3. Return the dough ball to the processor and whizz to knead to develop the gluten.
4. Remove from the bowl and knead on a lightly floured surface for 5 minutes.
5. Cover in cling film and leave to rest for 20 minutes.
6. Remove the clingfilm and roll the dough on a floured surface until it is a 20 x 20 cm square. Fold into quarters.
7. Cut into 1 cm wide noodles with a knife.
8. You can roll and cut using a pasta machine if you are skilled enough!
9. Cook noodles in a large saucepan 3/4 full of boiling water for 2 minutes. Keep the noodles moving to stop sticking. When the pasta is cooked it rises to the top.
10. Drain the noodles and put with a label on a plate ready for taste testing.
11. Repeat using other pastas to compare results.
12. Make notes as you work to show how easy it is to make the flour into a dough.
13. Photograph and ***evaluate*** the pastas for colour, taste and texture.



Pasta is made by hand or with a machine.



Make sure you make each pasta the same -

- Same weight of ingredients
- Knead for the same time
- Roll out for the same time
- Shape the same size - 1 cm strips
- Boil for the same time
- Drain the same way
- Taste and **evaluate** the same way.

Pasta - changing the flour

Analyse and Evaluate

Make notes on how the dough feels and how easy it is to work as you knead the pasta

Taste your cooked pasta and record your results.

Set up a **fair test** so every sample is

- The **same** size, served in the **same** way at the **same** temperature.

Think of your own Descriptors - Chewy, Firm, Tasty, Creamy colour.

Give each Descriptor a mark out of 5.

Present results on a chart with comments.

Descriptor for pasta when cooked	Very strong flour	Plain flour	00 Pasta flour	Strong flour
Chewy	5	4	5	5
Firm	5	4	5	5
Tasty	5	5	5	5
Slimy	4	4	4	4
Creamy colour	3	4	4	5

Use **The Nutrition Program** or an Excel sheet to present results as a **Star Profile**.

Evaluate the results.

How can this Investigation into gluten in pasta be used for practical cooking?

(Check if exam board needs this.)

This will help to decide which flours to use for pasta making.

- Strong flours and pasta flours make good, chewy pasta.
- Soft flours do not contain enough gluten so are not used for pasta.

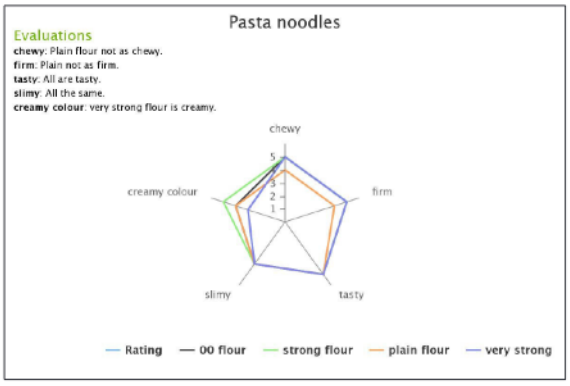
Conclusions

This Investigation shows that some flours are best to use for pasta because they have a high **gluten** content.

Higher **gluten** flours such as strong and 00 flour are better for bread and pasta.

Lower **gluten** flours such as self raising flour are used for cakes.

Photograph and taste cooked pasta.



Tasting notes

- *Plain flour was difficult to make into a dough and roll out.*
- *Strong flour is high in gluten, so made a good pasta*
- *00 Pasta flour is high in gluten and makes a soft, easy to roll pasta!*
- *Very strong flour made firm pasta.*

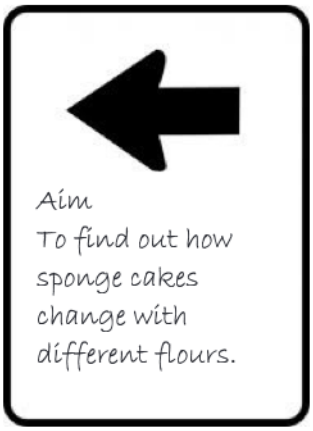
Sponge cakes - changing the flour

The Task

- *Flour is an important ingredient in making a sponge cake. Explore the different flours used in cake making and investigate their working characteristics and functional properties. Investigate how to produce a nutritionally improved sponge cake that is acceptable to consumers.*

Or

- ***Investigate** what type of flour is best for sponge cakes.*



Write the Aim of your Investigation.

Carry out

- Research,
- Investigation,
- **Analysis** and Evaluation for each Task.

Research

- Find sponge cake recipes
- Find different flours to use
- What is the science?
- What **Experiments** can I do?

This chart shows a summary of work for the Task.

Title of the Task	**Investigate** the flour used in cakes
Summary of Research	Look at sponge cake recipes, find out about flours, list science words, choose **Experiments**. Write Aim.
Hypothesis	White self raising flour is used for sponge cakes, so it may be the best choice. Changing the flours will alter the nutrition and change the **sensory** properties of the cakes.
Plan of action	Experiment by making 4 gluten ball samples using different flours and compare the amount of gluten in flours. Make 4 cake samples with different flours. Bake, photograph, taste, measure.
Experiments	
Analyse and **Evaluate**	Look at the results of **Experiments** showing flours in sponge cakes and interpret what you have found. Comment and explain the results, and **evaluate** the **Hypothesis**.
Conclusions	Compare the nutritional value of the cakes. Explain how the different cakes look, taste and feel.

Sponge cakes - changing the flour

Key science words to describe function of flour in sponge cakes	
• Gluten	• Coagulation
• Protein	• Structure

The facts

- Wheat flour contains starch and the protein, gluten.
- Gluten in wheat flour helps form the cake structure as the gluten coagulates and sets during baking.
- Higher gluten flours make cakes tough, so soft flours are used for cake making.

Soft, self raising flour (SR flour) is used for sponge cakes

Control recipe for sponge cakes
Ingredients
1 egg
60g of caster sugar,
60g Stork margarine
60g SR flour
½ tsp baking powder
1 tablespoon milk

Method

1. Preheat the oven to 180C / Gas 5.
2. Weigh all ingredients accurately and place in a bowl. Use All-in-one method.
3. Beat with an electric whisk for 2 minutes until smooth - Keep exact time.
4. Place 30g of mix in each cup case and cook on middle shelf for 20 minutes until firm and golden.
5. Cool on a cooling rack and label Control.

Equipment
Bun tins, cake cases, electronic scales, electric whisk, timer, ruler, paper, pen, camera

Other flours to use

- Plain flour with ½ tsp of baking powder
- 00 Flour with ½ tsp of baking powder
- Wholemeal flour with ½ tsp of baking powder
- Gluten free flour with ½ tsp of baking powder

For a **fair test**, beat each mixture for the same time.

Why add baking powder to the flours?
The flours in the test have no baking powder added, but the Control uses self raising flour which has added baking powder to make the cake rise. So, we've added ½ tsp of baking powder to make a **fair test** and so each batch of cakes rises.

Make your tests fair

- Weigh accurately at each stage
- Use clean equipment for each batch
- Take the same time for whisking and cooking.
- Place cakes in same oven, same shelf for same length of time.

What tests to use?

- Nutritional data
- **Sensory** charts - **star profile**s
- Measure the outcomes – weight, height
- Costs
- Ease of making / producing.

Sponge cakes - changing the flour

Look at the Nutrition of the different cakes.
Use the Nutrition Program or other
Nutritional **Analysis** programs for results.
These results show

- Fairy cakes - SR flour (control)
- Fairy cakes - Plain flour
- Fairy cakes - Wholemeal flour
- Fairy cakes - 00 flour

Recipe: Fairy cakes control

Ingredients: egg (24%), flour (24%), margarine (24%), caster sugar white (24%), milk (4%)
Net weight:250g
Portion weight:36g
Allergens: milk, gluten, eggs

Nutrition

Nutrition	Per 100g	Per portion	RI (women)	RI (men)	RI (child)	
Energy	1423 kJ	508 kJ	6%	5%	7%	
Energy	339 kcal	121 kcal	6%	5%	7%	
Fat	17 g	6.1 g	9%	6%	9%	●
Saturated Fat*	5.9 g	2.1 g	11%	7%	11%	●
Carbohydrate*	44 g	16 g	7%	5%	7%	
Total Sugars*	26 g	9.2 g	10%	8%	11%	●
Protein*	5.3 g	1.9 g	4%	3%	8%	
Fibre AOAC*	1.0 g	0.4 g	1%	1%	2%	
Salt	0.7 g	0.3 g	4%	4%	6%	●

* Data for some ingredients is not available

Recipe: Fairy cakes plain flour

Ingredients: flour (23%), egg (23%), margarine (23%), caster sugar white (23%), milk (3%), baking powder (0%)
Net weight:252g
Portion weight:36g
Allergens: milk, eggs, gluten

Nutrition

Nutrition	Per 100g	Per portion	RI (women)	RI (men)	RI (child)	
Energy	1430 kJ	515 kJ	6%	5%	7%	
Energy	342 kcal	123 kcal	6%	5%	7%	
Fat	17 g	6.1 g	9%	6%	9%	●
Saturated Fat*	5.9 g	2.1 g	11%	7%	11%	●
Carbohydrate*	43 g	15 g	7%	5%	7%	
Total Sugars*	25 g	9.2 g	10%	8%	11%	●
Protein*	5.5 g	2.0 g	4%	4%	8%	
Fibre AOAC*	0.7 g	0.3 g	1%	1%	2%	
Salt	0.8 g	0.3 g	5%	5%	7%	●

* Data for some ingredients is not available

Recipe: Fairy cakes wholemeal flour

Ingredients: caster sugar white (23%), wholemeal flour (23%), margarine (23%), egg (23%), milk (3%), baking powder (0%)
Net weight:252g
Portion weight:36g
Allergens: milk, eggs, gluten

Nutrition

Nutrition	Per 100g	Per portion	RI (women)	RI (men)	RI (child)	
Energy	1414 kJ	509 kJ	6%	5%	7%	
Energy	338 kcal	122 kcal	6%	5%	7%	
Fat	17 g	6.2 g	9%	7%	9%	●
Saturated Fat*	5.9 g	2.1 g	11%	7%	11%	●
Carbohydrate*	40 g	14 g	6%	5%	7%	
Total Sugars*	26 g	9.2 g	10%	8%	11%	●
Protein*	6.0 g	2.2 g	5%	4%	9%	
Fibre AOAC*	2.1 g	0.8 g	3%	3%	5%	
Salt	0.7 g	0.3 g	4%	4%	7%	●

* Data for some ingredients is not available

Recipe: Fairy cakes 00 flour

Ingredients: flour (23%), egg (23%), caster sugar white (23%), margarine (23%), milk (3%), baking powder (0%)
Net weight:252g
Portion weight:36g
Allergens: milk, eggs, gluten

Nutrition

Nutrition	Per 100g	Per portion	RI (women)	RI (men)	RI (child)	
Energy	1418 kJ	510 kJ	6%	5%	7%	
Energy	338 kcal	122 kcal	6%	5%	7%	
Fat	17 g	6.1 g	9%	6%	9%	●
Saturated Fat*	5.9 g	2.1 g	11%	7%	11%	●
Carbohydrate*	42 g	15 g	7%	5%	7%	
Total Sugars*	25 g	9.2 g	10%	8%	11%	●
Protein*	5.8 g	2.1 g	5%	4%	9%	
Fibre AOAC*	0.7 g	0.3 g	1%	1%	2%	
Salt	0.7 g	0.3 g	4%	4%	7%	●

* Data for some ingredients is not available

Sponge cakes - changing the flour

What does the Nutrition **Analysis** show?

- All cakes have similar calories, fat, sugar and salt.
- Protein is higher in wholemeal and 00 flour cakes.
- Fibre content is highest in wholemeal cakes and lowest in the gluten free cakes.

Recipe: fairy cakes gluten free flour

Ingredients: flour (23%), egg (23%), caster sugar white (23%), margarine (23%), milk (6%)
Net weight:235g
Portion weight:34g
Allergens: eggs, milk

Nutrition

Nutrition	Per 100g	Per portion	RI (women)	RI (men)	RI (child)	
Energy	1407 kJ	472 kJ	6%	5%	6%	
Energy	336 kcal	113 kcal	6%	5%	6%	
Fat	17 g	5.6 g	8%	6%	8%	
Saturated Fat*	5.8 g	1.9 g	10%	6%	10%	
Carbohydrate*	41 g	14 g	6%	5%	6%	
Total Sugars*	25 g	8.4 g	9%	7%	10%	
Protein*	3.2 g	1.1 g	2%	2%	4%	
Fibre AOAC*	0.1 g	0.0 g	0%	0%	0%	
Salt	0.5 g	0.2 g	3%	3%	4%	

*Data for some ingredients is not available

Photograph the stages of the experiment to show as evidence. You can **annotate** results.

Sponge cakes - changing the flour

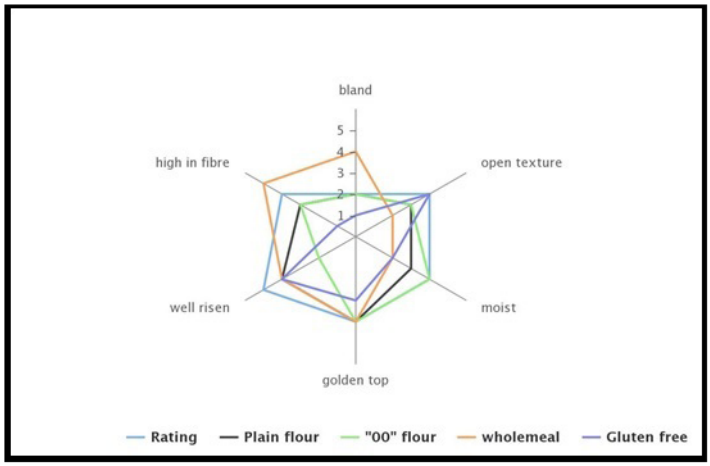
	Cooked weight of cake	Height	kcalories/100g	fibre g/ 100g
Control SR flour	25g	3.5cm	339	1g
Plain flour	26g	3 cm	342	0.7g
Wholemeal flour	27g	3.1cm	338	2.1g
00 flour	27g	2.8cm	338	0.7g
Gluten free flour	24g	3.2cm	343	0.1g

This chart shows the weight, height, kcalories and fibre for each cake.
Use the results in your **Conclusions.**

Star profile for **sensory** tests with **descriptors**

Words to describe the cakes
Descriptors
high in fibre
bland
open texture
moist
golden top
well risen

Fairy cakes



When you have completed the experiment, taste and test the cakes.
Draw up a **star profile** to compare results.

Annotate the **Star profile** to show what the results mean.

- The wholemeal cake tasted bland but was high in fibre.
- Most of the cakes were moist and had an open texture.

Sponge cakes - changing the flour

Analyse and Evaluate cake results

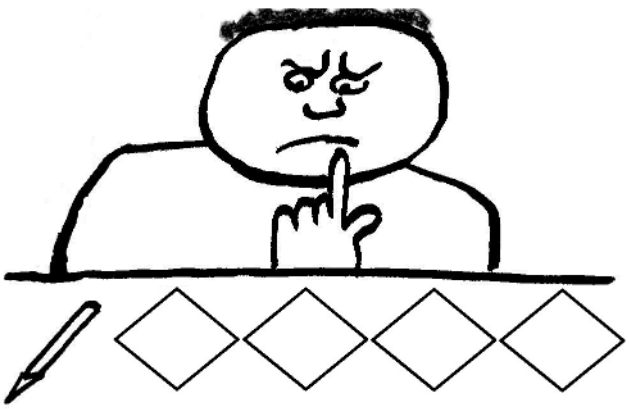
- Analyse and interpret the results of the Investigation.
- Sum up and decide on improvements.
- Link Research explaining the working characteristics, functional and chemical properties of the ingredient(s).
- **Evaluate** the **Hypothesis**/prediction with reasons.
- The **Hypothesis** is a statement which may be proved or disproved.

Conclusions

- Changing the flour did alter the nutritional profile of the cakes. Wholemeal flour increased the fibre content.
- The **sensory** properties of the cakes were similar, but the wholemeal ones had more taste. This could be from the "nutty" taste from the whole grain.
- I found that we could change the flour and still produce an acceptable edible cake for consumers which had improved nutritional properties.
- Xanthan gum can be added to gluten free flour to add structure to the cakes to stop them crumbling and improves the volume and texture of the cake.

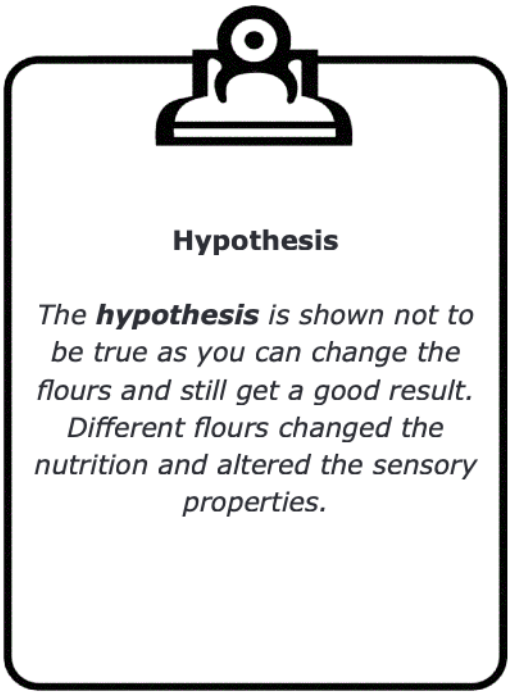
This investigation is useful as it shows that different flours can be used for cakes and this also improves the nutrition and the taste.

Make sure your tastings are a **fair test**.



Hypothesis

White self raising flour is used for sponge cakes, so it may be the best choice.
Changing the flours will alter the nutrition and change the **sensory** properties of the cakes.



To do

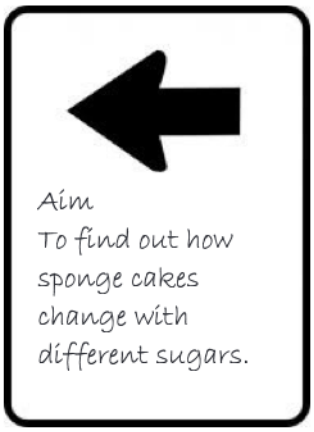
1. Suggest 3 ways you would make sure that you are carrying out a **fair test** when you taste the sponge cakes. (3 marks)
2. List the function of each of these ingredients in the sponge cake - a) egg, b) sugar, c) flour, d) margarine or butter. (4 marks)

(Thanks to Jill Oliver for this experiment)

Sponge cakes - changing the sugar

The Task

Sugar is an important ingredient in cakes, but we should eat less sugar. Investigate the working characteristics and the functional properties of sugar as an ingredient for cakes. Find out if you can reduce the sugar content or use alternative ingredients to make an attractive cake.



Carry out

- Research, Investigation, **Analysis** and Evaluation for each Task.

Research

- Identify **key words**, with their definition
- Find sponge cake recipes and make a plan of what you will do
- What sugars are available and what are their differences?
- What can be used as an alternative to sugar in baking – fruit, vegetables, syrup?

Explain what sugar does in cakes – its functional properties.
What are the nutritional differences between the sugars or the alternatives?

Title of the Task	**Investigate** sugars used in cakes
Summary of Research	Look at sponge cake recipes, find out about sugars, list science words, choose **Experiments**. Write Aim.
Hypothesis	A successful sponge cake can be made using less sugar than the traditional recipe, and alternatives to sugar can be used with equal success.
Plan of action	Make cake samples with different sugars and different sugar alternatives. Bake, photograph, taste, measure.
Experiments	Make identical cup cakes but vary the sugar and sugar alternatives.
Analyse and Evaluate	Look at the results of **Experiments** showing sugars in sponge cakes and comment and explain the results, and ***evaluate*** the **Hypothesis**.
Conclusions	Compare the nutritional value of the cakes. Explain how the different cakes look, taste and feel.

Research basic sponge recipe and method

- Write criteria for the perfect sponge cake – you can test your results against this.
- What is **fair testing** and what tests can be carried out?

Sponge cakes - changing the sugar

Function of sugar in cakes

- To provide sweetness and flavour
- To provide moisture
- To help cakes change colour to golden brown by caramelisation
- To act as a preservative and extend shelf life.

Key science words to describe function of sugar in sponge cakes	
• Caramelises	• Helps increase cake volume
• Moistens	• Aeration with fat

Descriptors for the perfect cake

- Well risen
- Golden brown top
- Light golden yellow interior
- Light open texture
- Quite moist

Control recipe for sponge cakes

Ingredients

1 egg
60g of caster sugar,
60g Stork margarine
60g SR flour
½ tsp baking powder
1 tablespoon milk

For a **fair test**, beat each mixture for the same time.

Method

1. Preheat the oven to 180C / Gas 5.
2. Weigh all ingredients accurately and place in a bowl. Use All-in-one method.
3. Beat with an electric whisk for 2 minutes until smooth - Keep exact time.
4. Place 30g of mix in each cup case and cook on middle shelf for 20 minutes until firm and golden.
5. Cool on a cooling rack and label Control.

Equipment

Bun tins, cake cases, electronic scales, electric whisk, timer, ruler, paper, pen, camera

Tip

Weigh each cake before baking to ensure all are the same.

Sponge cakes - changing the sugar

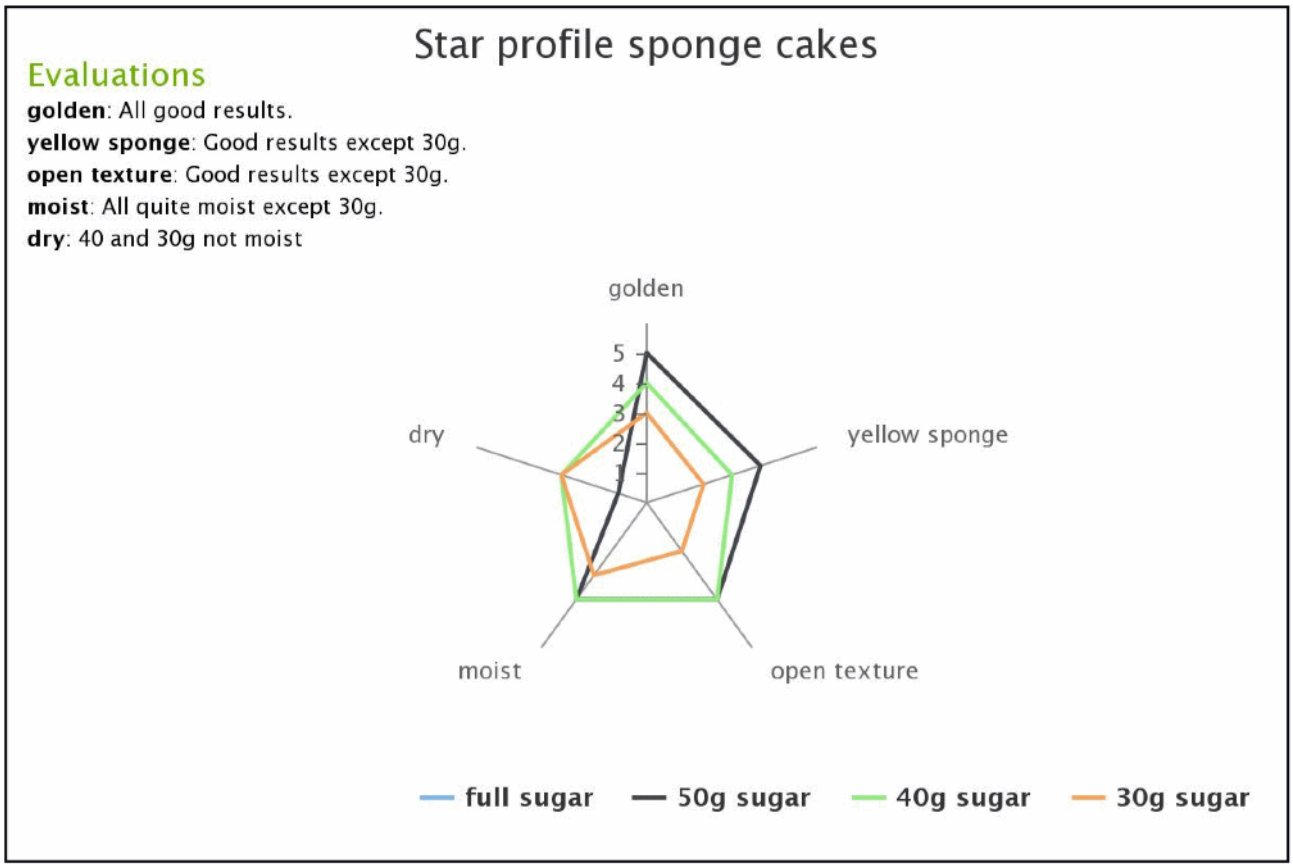
Prediction - which comes from the research and knowledge
With less sugar, the taste and colour will be affected but I think a reduction will still be edible.
Using less sugar should produce a paler cake due to less caramelisation.
I have no knowledge of how alternative sugars will react in a cake mix. I think colour and texture will be affected. Using fruit or vegetables may affect the cake density.

We made cakes with full amount of 60g sugar and then did a batch with 50g, 40g, 30g.
You can **evaluate** the Functional properties of sugar in cakes – the purpose for which the ingredient is being used and can be linked to – its structure, nutritional value, taste, texture, appearance, shelf life.

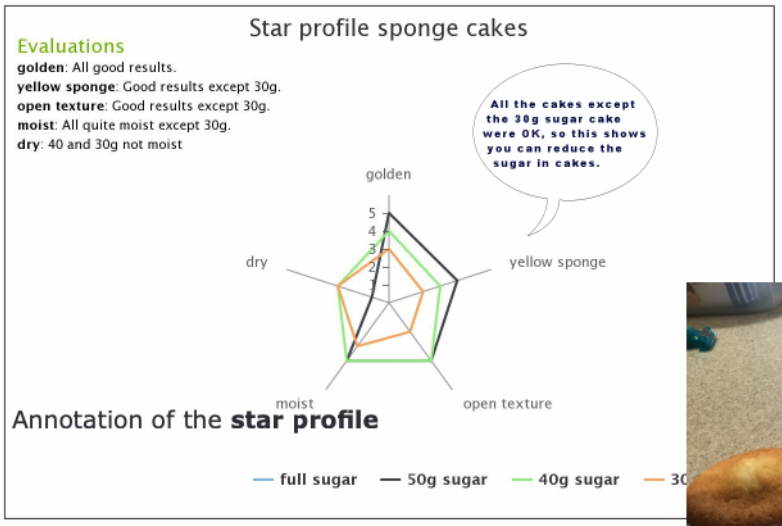
Use the Nutrition Program for Recipe **analysis** and **Star Profile** or other programs.

1. Create a recipe for your sponge cake in My Recipes.
2. Bake and compare your cakes and then click **Star Profile**.
3. Name the recipe '**Star profile** sponge cakes'.
4. Choose descriptors – how the cake should look and taste. The descriptors we chose were – golden, yellow sponge, open texture, moist, dry.
5. The Control cake was marked golden (5), yellow sponge (4), open texture (4), moist (4), dry (1) – this was our perfect cake.
6. Taste the cakes and mark them on the chart – tip in the +Add Taster put the name of the cake – for example, full sugar, 50g sugar.
7. The Nutrition Program **Star Profile** fills in – now you need to **Evaluate** the results under Evaluation – see our chart.

To get extra exam marks you can **annotate** the **Star profile**.



Sponge cakes - changing the sugar



Annotation of the **star profile**

Photograph you cakes and **annotate** the results.

Sugar alternatives

A wide variety alternatives to sugar is available in supermarkets but do they work in baking and will they reduce the sugar content?

Our experiment used the following alternatives to sugar

- Hermesetas sweetener (1/10th of normal weight) = 6g
- Silver Spoon Half spoon (use 1/3rd less) = 40g
- 1 ripe banana + 20g sugar

Control – use cakes from 1st experiment to save time and costs

Results of baked cakes	
Sugar	Golden top, bright yellow sponge, open texture, "cake" aroma, very moist, springy Made 8 cakes.
Hermesetas	Only made 6 cakes as weighed less, golden brown top, but flat in appearance and had deep cracks.
Half spoon	Only made 5 cakes. Light golden brown top, cake over spilling case, slight dome, but good even texture, only made 6 cakes.
Banana + 20g sugar	Darker of the three, made 8x40g cakes, despite whisking for the 2 minutes, the mix had the appearance of scrambled eggs.

Sponge cakes - changing the sugar

Nutrition in cakes - the calories and sugar content		
	Calories per 100g	Sugar per 100g
Sugar	335	25g
Hermesetas	320	1.1g
Half spoon	329	14g
Banana + 20g sugar	252	14g

Recipe: Sponge cake + Sugar

Ingredients: margarine (23%), egg (23%), sugar (23%), flour (23%), milk (5%), baking powder (0%)
Net weight:257g
Portion weight:32g
Allergens: milk, gluten, eggs

Nutrition

Nutrition	Per 100g	Per portion	RI (women)	RI (men)	RI (child)
Energy	1403 kJ	451 kJ	5%	4%	6%
Energy	335 kcal	108 kcal	5%	4%	6%
Fat	17 g	5.4 g	8%	6%	8%
Saturated Fat*	5.8 g	1.9 g	9%	6%	9%
Carbohydrate*	42 g	14 g	6%	5%	6%
Total Sugars*	25 g	8.0 g	9%	7%	9%
Protein*	5.5 g	1.8 g	4%	3%	7%
Fibre AOAC*	0.7 g	0.2 g	1%	1%	1%
Salt	0.8 g	0.3 g	4%	4%	6%

* Data for some ingredients is not available

Recipe: Sponge cake + Hermestas

Ingredients: egg (29%), margarine (29%), flour (29%), milk (7%), Hermesetas granulated sweetener (2%), baking powder (0%)
Net weight:203g
Portion weight:25g
Allergens: milk, gluten, eggs

Nutrition

Nutrition	Per 100g	Per portion	RI (women)	RI (men)	RI (child)
Energy	1329 kJ	337 kJ	4%	3%	5%
Energy	320 kcal	81 kcal	4%	3%	5%
Fat*	21 g	5.4 g	8%	6%	8%
Saturated Fat*	7.3 g	1.9 g	9%	6%	9%
Carbohydrate*	25 g	6.4 g	3%	2%	3%
Total Sugars*	1.1 g	0.3 g	0%	0%	0%
Protein*	7.0 g	1.8 g	4%	3%	7%
Fibre AOAC*	0.9 g	0.2 g	1%	1%	1%
Salt	1.0 g	0.3 g	4%	4%	6%

* Data for some ingredients is not available

Recipe: Sponge cake + Silver spoon Half Spoon

Ingredients: margarine (26%), flour (26%), egg (26%), Silver Spoon Half Spoon (13%), milk (6%), baking powder (0%)
Net weight:227g
Portion weight:28g
Allergens: milk, eggs, gluten

Nutrition

Nutrition	Per 100g	Per portion	RI (women)	RI (men)	RI (child)
Energy	1369 kJ	388 kJ	5%	4%	5%
Energy	329 kcal	93 kcal	5%	4%	5%
Fat*	19 g	5.4 g	8%	6%	8%
Saturated Fat*	6.5 g	1.9 g	9%	6%	9%
Carbohydrate*	33 g	9.4 g	4%	3%	4%
Total Sugars*	14 g	3.9 g	4%	3%	5%
Protein*	6.3 g	1.8 g	4%	3%	7%
Fibre AOAC*	0.8 g	0.2 g	1%	1%	1%
Salt	0.9 g	0.3 g	4%	4%	6%

* Data for some ingredients is not available

Recipe: Sponge cake + Banana and sugar

Ingredients: banana (31%), margarine (18%), egg (18%), flour (18%), sugar (6%), milk (4%), baking powder (0%)
Net weight:317g
Portion weight:40g
Allergens: gluten, eggs, milk

Nutrition

Nutrition	Per 100g	Per portion	RI (women)	RI (men)	RI (child)
Energy	1053 kJ	417 kJ	5%	4%	6%
Energy	252 kcal	100 kcal	5%	4%	6%
Fat	14 g	5.4 g	8%	6%	8%
Saturated Fat*	4.7 g	1.9 g	9%	6%	9%
Carbohydrate*	28 g	11 g	5%	4%	5%
Total Sugars*	14 g	5.4 g	6%	5%	6%
Protein*	4.8 g	1.9 g	4%	3%	8%
Fibre AOAC*	1.0 g	0.4 g	2%	2%	3%
Salt	0.6 g	0.3 g	4%	4%	6%

* Data for some ingredients is not available

Sponge cake + Sugar shows Red in traffic lights when analysed on the Nutrition Program.
Hermesetas is green which is good, but the cake was poor quality.
Silver Spoon and banana recipe are Amber which means OK.

Sponge cakes - changing the sugar

Evaluate and **annotate** the **Star Profile** with your comments. This is part of the **Analysis**.

Analysis and Evaluation

- Interpret the results of the Investigation.
- Sum up and decide on improvements.
- Link Research explaining the working characteristics, functional and chemical properties of ingredients.
- **Evaluate** the **Hypothesis**/prediction with reasons.
- Explain how the results/findings can be used in food preparation and cooking.
- (Check exam board)

What about the **Hypothesis**?

- A **Hypothesis** statement may be proved or disproved.
- It explores how ingredients work and why.

Hypothesis for sugar in cakes

A successful sponge cake can be made using less sugar than the traditional recipe, and alternatives to sugar can be used with equal success.

Results

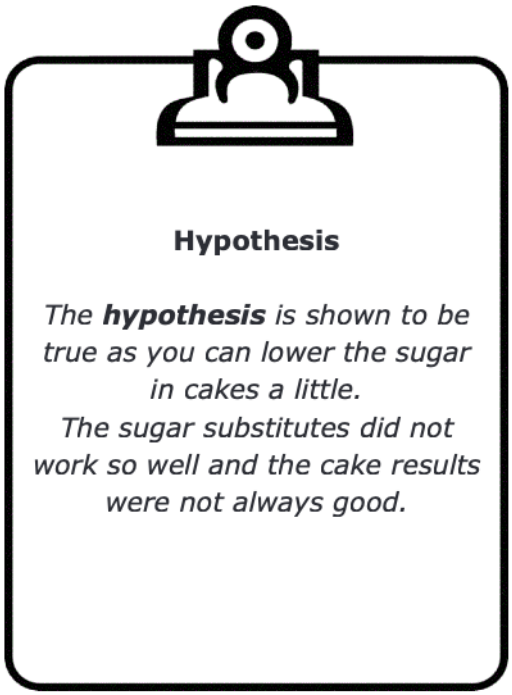
Successful sponge cakes were made using less sugar than the 60g sugar recipe.
When the sugar was too low (30g), the cakes were dry and not well risen.

Sugar substitutes gave strange results
Hermesetas produced poor results.
Half Spoon made a good cake.
Banana and sugar made a dark, poor quality result.

What about nutrition?
By lowering the sugar from the Control recipe, a lower sugar cake was made, so this is a good idea.

The alternative sweeteners Hermesetas, Half Spoon, Banana and sugar had a lower sugar content in a 100g. But the cakes were not such good quality so more investigation is needed with this.

(Thanks to Jill Oliver for this experiment)



Hypothesis

*The **hypothesis** is shown to be true as you can lower the sugar in cakes a little.*
The sugar substitutes did not work so well and the cake results were not always good.

Conclusions

The investigation into lowering the sugar in cakes showed that good quality cakes could be made, but the sugar is still needed and when too low, the cake was not a success.
I need to investigate the use of sugar substitutes further and research how fruit and vegetables can be used as sugar replacements.

These results mean I can make lower sugar cakes by adapting the basic recipe.

Eggs as setting agents

The Task

Eggs are used as a setting agent to set liquids for quiches and custards such as creme caramel. Use scientific terms to explain how eggs set liquids. Investigate and explore the cooking temperatures, timings and cooking methods that create the best results for these dishes.

Carry out Research, Investigation, **Analysis** and Evaluation for each Task.

Research

Find out how eggs set mixtures, Find recipes for quiches and custards, What is the science?, What **Experiments** can I do?

Title of the Task	**Investigate** eggs and setting properties
Summary of Research	Look at how eggs set mixtures, list science words, list ingredients to use, choose **Experiments**. Write an Aim.
Hypothesis	Egg custards need gentle cooking and careful temperature and time measurement to get a well set, non curdled result.
Plan of action	Experiment with cooking egg custards in the oven for different times, measuring temperature.
Experiments	Egg custard making experiment. Explore temperature changes. Investigate effect of higher heat.
Analyse and Evaluate	Look closely at the results of **Experiments** and interpret what you have found. Comment and explain the results, and **evaluate** the **Hypothesis**.
Conclusions	Compare custards and **Evaluate** results. Explain how to make a successful custard.

The science facts

- When the protein in eggs is heated its chemical structure is changed.
- The protein is denatured. This process cannot be reversed.
- With continued heating, proteins coagulate and set.
- The white begins to coagulate at about 60°C and the yolk at about 65°C.
- Coagulation of whole eggs starts about 63°C.
- The coagulation process of eggs is complete at 70°C.
- Over cooking makes the protein become tough and the protein coagulates more.
- The strands of egg protein shrink and water is squeezed out. This is called syneresis.

Eggs as setting agents

Experiment
Sample custard recipe
Ingredients
1 egg, 100ml milk, ½ teaspoon sugar (optional)
Makes 4 small custards

Whisk eggs and milk together

Tip
Make up 2 batches of eggs and milk so that you have 8 small custards to compare results.

Method
1. Preheat the oven to 150°C/Gas
2. Use 4 ramekin dishes or 4 small oven proof tea cups to cook the custard.
3. Whisk the eggs and sugar until smooth then beat in the milk.
4. Pour equal amounts of the mixture into the 4 ramekins - about 40ml each.
5. Put the ramekins in a roasting tin which is half filled with boiling water. This is called a bain marie.
6. Cook for 20-30 minutes in the oven until the custard is set.

Equipment - measuring jug, whisk, bowl, roasting tin, ramekins, temperature probe, oven glove, labels, timer - you can use your phone, camera

Experiment tips
- Make the custards the same way and use the same size ramekin dishes or similar small dishes to bake the custards.
- Use a phone or cooker timer to set the 5 minute timings to remove each dish.
- Clean the food probe after each temperature test.
- Taste the set custards to discover the best results.

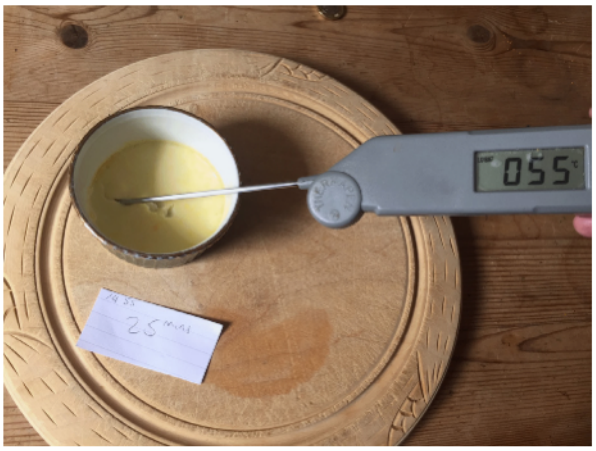
The aim
Find out how long the custards take to set and the temperature reached on setting.
Take out one ramekin after 5 minute intervals, measure the temperature and write down what you see. The results will help to understand how to make a well set custard or quiche.
Record your results on a chart like the one shown.

Cooking time	Temperature of mixture	What it looks like
5 minutes		
10 minutes		
15 minutes		
20 minutes		
25 minutes		
30 minutes		
35 minutes		
40 minutes		

Eggs as setting agents

Analysis

Photograph your work and **annotate** to explain results.



Photograph your work as you carry out the **Experiments**.

These photos show the timings of the custards, the temperature probe measuring the custard temperature and syneresis when the custard is overcooked. The arrow shows liquid seeping out of the custard.

Record your results on a chart like the one shown.

Cooking time	Temperature of mixture	What it looks like
5 minutes	47°C	VERY RUNNY
10 minutes	56°C	RUNNY BUT SETTING
15 minutes	57°C	SETTING A LITTLE
20 minutes	60°C	SETTING A BIT MORE
25 minutes	60°C	SET!
30 minutes	66°C	SET BUT BIT WATERY
35 minutes	73°C	SET BUT WATERY
40 minutes	73°C	MORE WATER

Eggs as setting agents

Key science words to describe eggs as setting agent		
• Setting	• Coagulation	• Syneresis
• Protein	• Structure	• Denaturation

Evaluate
My **Experiments** show that the custards begin to set after 20 minutes and when a temperature of 60°C and above is reached. The egg proteins are coagulating.
When the custards are cooked for longer, water leaches out due to **syneresis** when the egg protein shrinks and the custard separates.

My **hypothesis**
Egg custards need gentle cooking and careful temperature and time measurement to get a well set, non curdled result.

The experiment shows this and when the custard is overcooked, the mixture breaks down and separates.

Conclusions
When custards are cooked at a low oven temperature in a bain-marie, the custards begin to set when the mixture has reached 60°C after 20 minutes.
When the custard reaches a higher temperature with longer cooking, the custard begins to separate, curdle and water comes out.

Eggs are used to set the filling for quiches.

The science
- When the protein in eggs is heated its chemical structure is changed.
- The protein is denatured. This process cannot be reversed.
- With continued heating, proteins coagulate and set.
- The white should begin to coagulate at about 60°C and the yolk at about 65°C.
- As the egg proteins set, they form a network which makes the custard become firm.
- Over cooking makes the protein become tough and the strands of protein shrink and water is squeezed out. This is called syneresis.

Extra investigation
If I had time I could cook an egg custard in a saucepan to investigate how to control the heat to avoid curdling. I could also increase the oven temperature to see the effect on egg coagulation.

This investigation is useful because it shows that dishes such as quiches and custards need care with timing, oven settings and temperature control to get good results.

Eggs and foams

The Task
Investigate *what happens when you whisk egg whites to make meringues.*

Carry out
- Research,
- Investigation,
- **Analysis** and Evaluation for each Task.

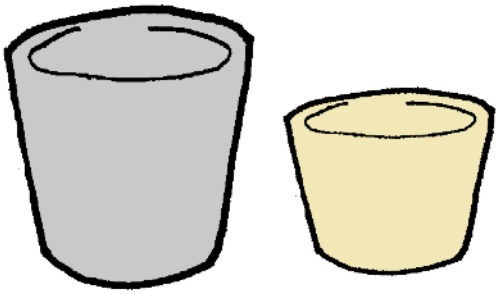
Research
- Find information on whisking egg whites
- Find different ingredients to use to make meringues
- What is the science?
- What **Experiments** can I do?

Write the Aim of your Investigation.

Summary of work to investigate egg white foams and meringues

Title of the Task	**Investigate** eggs and foams
Summary of Research	Look at how to whisk eggs and meringue recipes, list science words, list ingredients to use, choose **Experiments**. Write an Aim.
Hypothesis	Special conditions are needed to whisk egg whites to make a foam. Other ingredients can be added to help form a stable meringue.
Plan of action	Experiment with whisking egg white and explore what happens when other ingredients are added.
Experiments	Egg white whisking experiment. Explore how to add sugar and what types of sugar to choose. Explore adding other ingredients to the meringue.
Analyse and **Evaluate**	Look closely at the results of **Experiments** and interpret what you have found. Comment and explain the results, and **evaluate** the **Hypothesis**.
Conclusions	Compare meringues and **Evaluate** results. Explain how to make a successful meringue.

Investigate the types of bowl to use to whisk egg whites. Copper, metal, plastic, ceramic?



Eggs and Foams

Key science words to describe eggs and foams		
• Protein	• Coagulation	• Albumen
• Denature	• Foam	• Cross links
• Network	• Stable	• Elasticity

You can beat egg whites into a foam.
Use a hand or an electric whisk.

The science facts

- Egg whites make meringues, and air bubbles are beaten into the egg white (albumen) which is a water and protein solution.
- Meringues are **foams** where gas bubbles are suspended in a liquid.
- During beating, egg proteins (albumen) unfold and change - *denature* - to enclose the air.
- This creates **cross links** which form a network or matrix which holds the air bubbles in place.
- The beaten egg forms a **colloidal foam** - a gas-in-liquid foam.
- Sugar dissolves into the egg white foam and bonds giving strength, stability and elasticity.
- The egg whites and sugar increase the foam volume as more bubbles of air form.
- When the whisked egg white is heated, the air bubbles expand, water evaporates and the egg white protein **denatures, coagulates** and sets, holding the network in place.
- A crisp sugar-protein mesh is formed on baking.

Experiment

Overbeat eggs to see how they break down

Ingredients

1 egg white at room temperature - warm egg whites beat into a foam better than cold ones.
You need electric, rotary or balloon whisk.

Method

1. Put the egg white in a bowl and whisk until it becomes a thick foam.
2. Keep whisking until the egg white becomes clumpy, changes and releases water.
3. You have overwhipped the egg white and the foam and the protein bonds have broken down.

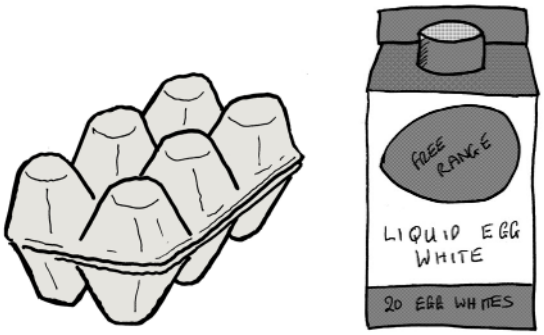
Eggs - Foams

Mini meringues

Ingredients
1 large egg white or 30g/ml ready to use egg white
100g caster sugar

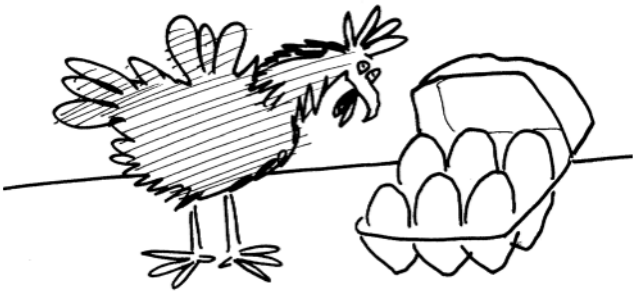
Method
1. Line the baking tray with parchment paper.
2. Preheat the oven 150°C/Gas 1.
3. Crack the eggs to separate the whites from the yolks - or buy liquid egg white.
4. Put the egg whites in a metal or glass bowl and whisk until the egg whites are fluffy and stand in soft peaks.
5. Slowly whisk in the sugar a teaspoon at a time.
6. When the sugar is added, whisk for another minute so that the sugar is absorbed.
7. Pile heaped dessert spoons of the meringue onto the parchment paper - try and make them the same size and shape. This is tricky. This recipe makes 5-6 meringue spoonfuls.
8. Bake in the oven for 35 mins then turn off the oven and leave for 1 hour to crisp the meringues.

Equipment - Baking tray, parchment paper, bowl, whisk (electric or hand), spoon, cooling rack.



You can use fresh eggs for this experiment. Decide what temperature the eggs must be.

To save wastage, try ready-to-use liquid egg whites - which may contain guar gum.
But is this a ***fair test***?!



How old should the egg be for the test and what temperature - fridge or room temperature? Find out.

Carry out **fair test**s.
Set up a **control** with egg white whisked with no added sugar. Bake it and test with the other results. Discover the role of sugar in meringue.

Experiment with extra ingredients

Eggs - Foams

Which sugar to use?
Check some meringue recipes and find which sugars are chosen.
Experiment with different sugars and explore how easily each one beats into a foam and what the results look and taste like.
You need 1 egg white (30g)
50g sugar for each experiment.

What type of sugar to use?

The science

- If you add sugar too early when whisking the egg white, the foam does not form so easily and this makes a weak meringue mix.
- Sugar is usually added to the egg whites after the foam has formed.
- Sugar improves the foam's stability.
- Sugar hangs onto the water in the egg white and lets the protein set to form the meringue structure.
- If more sugar is added, the meringue increases in size and has a crisper texture.
- Granulated sugar doesn't dissolve easily and leaves a gritty texture.

Experiment by adding extra ingredients

Add one of these ingredients when you are putting the sugar into the whisked egg white.
You need 1 egg white (30g) and 50g sugar for each experiment.

Test what happens if you add oil, vinegar or cream of tartar to whisked egg whites.

Things to try

- Salt - try a large pinch
- Vinegar - ½ tsp
- Cream of tartar - ½ tsp
- Oil - ½ tsp

Salt increases the whipping time for the egg whites and lowers the stability of the foam.

The science
Acids such as vinegar and cream of tartar slow down the breakdown of the protein links when whisking egg whites.
The foam is therefore more stable and more air can be added so makes a better meringue.
Fatty ingredients like egg yolk and oil interfere with the protein bonding when whisking a foam and make it harder to beat. This is why you must remove egg yolk from egg whites for meringue.

Eggs - Foams

As you work, record your findings and photograph and make charts of your results.

Make charts to record the results for changing the sugar an adding other ingredients - you choose the tests to carry out.

Ingredient	How many made	Comment
No sugar	4	Baked golden and structure collapsed to crumbs when baked
Caster sugar	5	Good volume, nice crunchy texture
Granulated sugar	4	Good volume very crunchy
Icing sugar	5	Hard to whisk in sugar and went slimy. Made hard meringues

Ingredient	How many made	Comment
Oil	3	Would not whisk. So baked flat and did not rise. Very crisp result
Vinegar	6	High volume meringue, firm outside very chewy inside
Cream of tartar	5	Good volume meringue, light and crisp
Salt	4	Sticky, soft, salty, chewy meringue

Things can go wrong!

Here are some things which stop egg whites from whisking easily -

- Greasy bowls and equipment
- Egg yolks in the egg white
- The egg whites are not whisked enough before adding the sugar
- Adding the sugar too quickly
- Adding ingredients that stop the foam from being stable.

These are all ideas for **Experiments** to see how best to make an egg white foam into meringue.

Photograph all of your work and annotate the results to explain what you have found.

Eggs - Foams

Analyse and Evaluate

- Interpret the results of the Investigation.
- Sum up and decide on improvements.
- Link **Research** explaining the working characteristics, functional and chemical properties of the ingredients.
- **Evaluate** the **Hypothesis**/prediction with reasons.
- Explain how the results/findings can be used in food preparation and cooking.

(Check exam board)

Check your List to record results.

Check List to record results	Yes	Not yet	Comments
I have photographed the results.			
I **Annotated** the photographs and other results.			
I've included some charts.			
I've shown **Sensory** testing methods.			
I **Annotated** the **Tasting** results.			
I've shown **Experiment** results.			

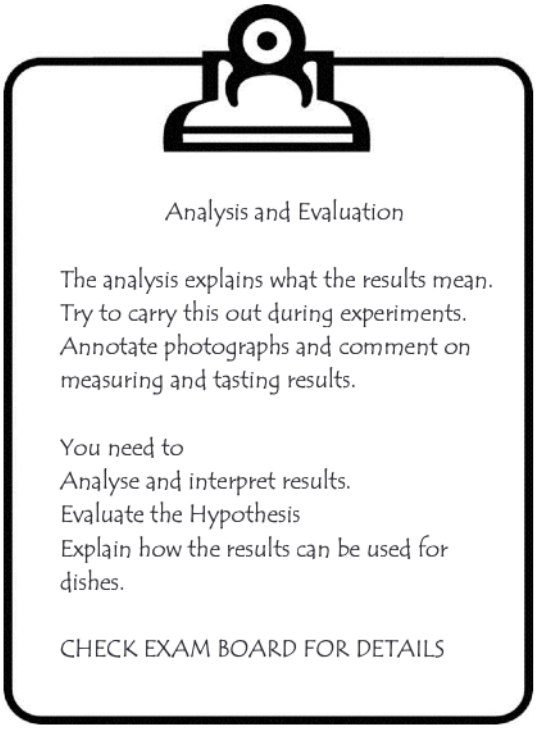
What about the ***Hypothesis***?
The **Hypothesis** is a statement which may be proved or disproved.
It explores how ingredients work and why.

My **Hypothesis** for the egg foam task -
Special conditions are needed to whisk egg whites to make a foam. Other ingredients can be added to help form a stable meringue.

The **Hypothesis** is shown to be true and I found that the fat found in oil stopped the egg white whisking up. If sugar is added too quickly the foam does not form and icing sugar didn't help the foam much.
Acid ingredients like vinegar and cream of tartar helped the foam. Sugar was an essential ingredient for the meringue.

How can this Investigation into egg white foam be used for practical cooking?
(Check if exam board needs this.)

- This experiment helps choose a method for beating and choosing sugar. It also helps to decide whether to add other ingredients such as cream of tartar.



Conclusions
The investigation of making and baking the meringue showed how some ingredients worked better than others.
I needed to repeat the **Experiments** as some results such as using icing sugar did not turn out as expected.
I also didn't get the baking times the same as the oven was needed to cook more meringues.

Website	Information
www.bbc.co.uk/food	Articles and information.
www.bbc.co.uk/ education	BBC Bitesize revision.
www.ifst.org/ lovefoodlovescience	Love Food Love Science
www.egginfo.co.uk	Egg Info

References
List the books, internet, magazines used.
Harold McGee On Food and Cooking

Mini Investigation Tasks

The Task

Show and explain how popcorn is made and explore how to use this investigation in cooking.

Why popcorn?

- Popcorn is a popular teenage snack
- It's a good starter lesson for NEA 1
- You can make popcorn quickly
- The nutrition content is 'empty' - it's just starch
- Popping corn costs 22g for 100g
- 10g makes a snack costing 2p
- Cooked in a microwave it is a science challenge!
- Check on size of cinema bags of popcorn and see the profit that is made.

Research

- Find out the ways popcorn is made.
- Investigate the **food science** of popcorn.
- What are the working characteristics, function and chemical properties of popping corn?
- What is the nutritional value of popcorn?
- Come up with a **Hypothesis** - what you think will happen in the investigation and why.

Investigation

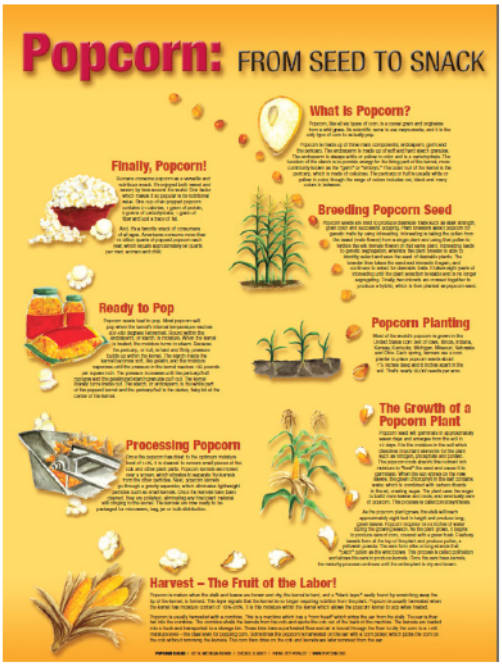
- Experiment with making popcorn - cooking in the microwave works well.
- Aim of Investigation - to find out how popcorn cooks - the **food science**, its nutrition and uses.
- Record weight and volume of cooked popcorn.
- Carry out a tasting of different cooking methods.

Analysis and Evaluation

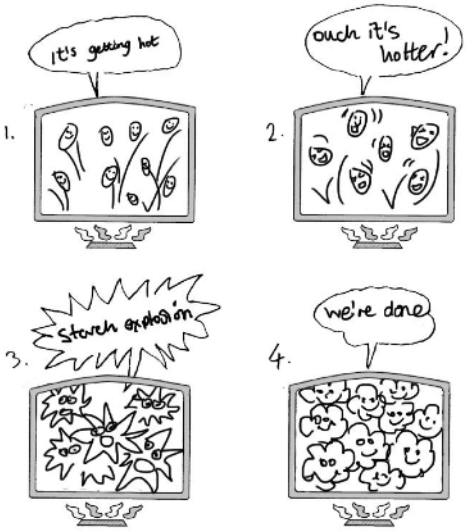
- Look at experiment results and write **conclusions** about working characteristics, function and chemical properties of popcorn.
- Think of further investigations.
- Show how the investigation can be used to improve cooking knowledge.

To do

Find the nutritional information for types of popcorn, including salty and sweet popcorn. Comment on your findings.



Poster from popcorn.org with loads of info.



Popcorn starch gelatinises as it explodes.

Record weight and volume of cooked popcorn.

Mini Investigation Tasks

Ideas for Investigation Tasks that can be used to practise before the full NEA 1.

Eggs

1. Make a batch of meringues and explain the changes that take place with the egg white protein.
2. Show how the setting of egg protein can be affected when making baked egg custard.
3. Show and explain how egg white foaming is affected when other ingredients are added.
4. Demonstrate how eggs are used to make mayonnaise and explore how to prevent the mix from separating.
5. Investigate the changes that take place when eggs are cooked by boiling, poaching or frying.

Enzymic browning

1. Investigate which fruits and vegetables turn brown, when this happens and how enzymic browning be slowed down or stopped.

Fruits and vegetables

1. Investigate how the texture of fruits and vegetables changes when cooked.

Sugar in cooking

1. Demonstrate the role of sugar in baked goods and explore how it can be reduced.
2. Investigate what happens when sugar is heated.

Fish and meat

1. Investigate the effect of acid ingredients on fish and meat which can be used to tenderise and marinate.

Cheese

1. Investigate the changes that take place when cheese is cooked in different ways.

Fats in cake making

1. Demonstrate the properties of fats when making a sponge cake using the creaming method. Which fat produces the best results? Explain why.

Flour for breadmaking

1. Investigate the different flours used for breadmaking and explore which flour makes the best bread.

Potatoes

1. Potatoes can be cooked in many ways. Investigate how the properties of the potato are changed by the cooking method.

Popcorn - just for fun!

1. Show and explain how popcorn is made and explore how this investigation can be used in cooking.

Tasting and Sensory Tests

Set up a **Tasting** panel for **Sensory Tests** to get results of your Investigation.
Here are some Tips:

1. Make sure the **Tasting** area is clean and hygienic.

2. Set up a **fair test** so every sample must be
- The same size
- Served in the same way at the same temperature.
- You can give samples random numbers so that the tasters don't know which is which.

3. One person at a time should taste the foods and not share results with others.

4. Give instructions so that your tasters know what to do.

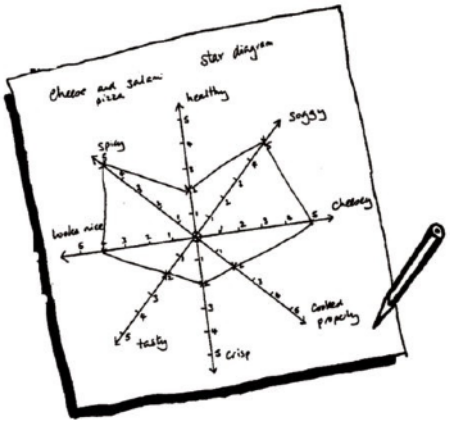
5. Record results on charts or using computer software like The Nutrition Program or Excel.

6. If using a **Star Profile**, hand draw the result, use Excel or The Nutrition Program. **Annotate** the results to show your **Evaluation.**

This chart shows how to taste scones.

Make samples the same size and serve in the same way.

Label samples with random numbers or shapes. There's no need to wear a blindfold!



The **Star Profile** can be drawn by hand.

To do

1. Explain why it is important to set up a **fair test** for food tasting. (2 marks)

Cooking links with Investigations

Students like to cook so here are some recipe ideas to show how their **Research** into the **food science** and function of ingredients can be extended for practical lessons.

Food Investigations	Using the Investigation for practical lessons
Thickening sauces and soups - using **starches** to show **gelatinisation.**	Learn how to make different sauces thickened with **starch** to show technical skills:Roux method, All in one method, Bechamel, Veloute Thickening sauces to make tomato sauce for pasta. Cheese sauce for cauliflower cheese, curry sauce for vegetarian curries. Sweet sauces such as lemon sauce with pancakes, an arrowroot sauce as a fruit flan glaze.
Basic scone or cake recipe - investigating **chemical raising agents**.	Use the scone recipe **Research** to make a range of savoury and sweet dishes: Cheese and herb scones, Scone based pizza Use self raising flour to make cakes and biscuits. Make savoury or sweet muffins.
Making shortcrust pastry - investigating the fats to use.	Use the pastry to make a range of dishes and show technical skills Line a flan ring with pastry to make savoury quiches and fruit tarts. Prepare savoury dishes such as: Cheese straws, cheese pastry with toppings, Vegetarian, cheese or meat pasties, Chicken pie.
Making shortcrust pastry - investigating the flours to use.	Show how different pastries can be used to make higher fibre dishes. Use wholemeal flour to make pasties, pies and flans. Look at pastries from around the world and **Experiment** with flours and fats.
Making things with popcorn	Popcorn has to be eaten very quickly after it is made. Try adding spices to the popcorn such as cinnamon and nutmeg with sugar. Toss in butter with some salt. You can make toppings for fruit dishes - this needs experimentation.

Exam boards Non Examined Assessment NEA 1

Non Examined Assessment NEA 1
For all exam boards, the process of NEA 1 is very similar, but check detailed requirements with your board choice.
For all boards 15% of the total marks is awarded for the NEA 1 (Non Exam Assessment 1).

There is a choice of Tasks to assess the scientific principles underlying the preparation and cooking of food.
Reports can be written or electronic and must include photographic evidence.
The word guideline is 1,500–2,000 words (plus any charts, graphs and photographs). This is about 4–6 pages when typed with a font size of 11. (Ofqual requirement) Words on charts included.

Some students will select and conduct similar **experiments**. But each student will conduct their own work, so each written document will be different in content and style. **Conclusions** will vary from student to student.

A report includes
- **Research** into 'how ingredients work and why',
- Practical Investigation with evidence and draws
- **Conclusions** through **Analysis and Evaluations**.

Summary of NEA 1 Investigations for AQA, Eduqas, OCR exam boards.

AQA Marks Non Exam Assessment NEA 1
Time 10 hours recommended 30 marks 1500 - 2000 words 6-8 sides A4

A	**Research**	6
B	**Investigation**	15
C	**Analysis** and **Evaluation**	9
Total		30

Research
- Analyse the task, explaining the background research.
- Carry out secondary research, using different sources, focusing on the working characteristics, functional and chemical properties of the ingredients.
- Analyse the research and use the findings to plan the practical investigation.
- Establish a **hypothesis**/predict an outcome as a result of the research findings. The **hypothesis** should be a statement which may be proved or disproved.

Investigation
- Investigate and **evaluate** how ingredients work and why through practical experimentation. Each investigation should be related to the research and have a clear aim which can then be concluded.
- The number of investigations will be determined by the complexity of the investigations.
- A range of appropriate testing methods should be identified and carried out to record the results e.g. **annotate**d photographs, labelled diagrams, tables, charts, **sensory** testing methods, viscosity tests.

Analysis and **Evaluation**
- Analyse and interpret the results of the investigative work. The results will be linked to the research and data explaining the working characteristics, functional and chemical properties of the ingredient(s)
- **Evaluate** the **hypothesis**/prediction with justification.
- Explain how the results/findings can be applied in practical food preparation and cooking.

Key words - secondary research, **hypothesis**, predict outcome, aim, **annotate**d photographs, labelled diagrams, **sensory** testing methods, viscosity, practical food preparation.

Exam boards Non Examined Assessment NEA 1

WJEC Eduqas Non Exam Assessment NEA 1
30 marks 1500 - 2000 words 8 assessment hours
A scientific food investigation to assess student knowledge, skills and understanding in relation to scientific principles underlying the preparation and cooking of food.

30 marks 1500 - 2000 words
Time 8 assessment hours recommended

A	**Research**	5
B	**Investigation**	15
C	**Analyse and Evaluate**	10
Total		30

Research and plan the Task
Investigate the working characteristics, function and chemical properties of ingredients through practical experimentation and use the findings to achieve a particular result.
Analyse and evaluate the task
Produce a report which evidences all of the above and includes photographs and/or visual recordings to support the investigation

Students should know
- How food investigations are conducted, with emphasis on food science aspects
- How to create a ***hypothesis***
- The importance of research tasks, planning tasks, carrying out tasks and evaluating tasks.

Other advice from Eduqas
- Only change one thing at a time in each experiment, so that it is clear to see what has happened in each test.
- Have a control – a standard recipe and method with which you compare your other results.
- Measure weights, record times accurately. Make use of precise measuring equipment such as digital scales, timers.
- Approach the investigations as you would a science experiment. Use appropriate ***sensory*** testing methods and present findings in tables, graphs.

OCR Non Exam Assessment NEA 1
Tasks assess the scientific principles underlying the preparation and cooking of food: carbohydrates, fats/ oils, protein, fruit and vegetables.
Investigate and **evaluate** an understanding of the working characteristics, functional and chemical properties of ingredients and use the findings of that investigation to achieve a particular result with respect to the preparation and cooking of food.

Time 10 hours recommended
45 marks 1500 - 2000 words 10 guided hours

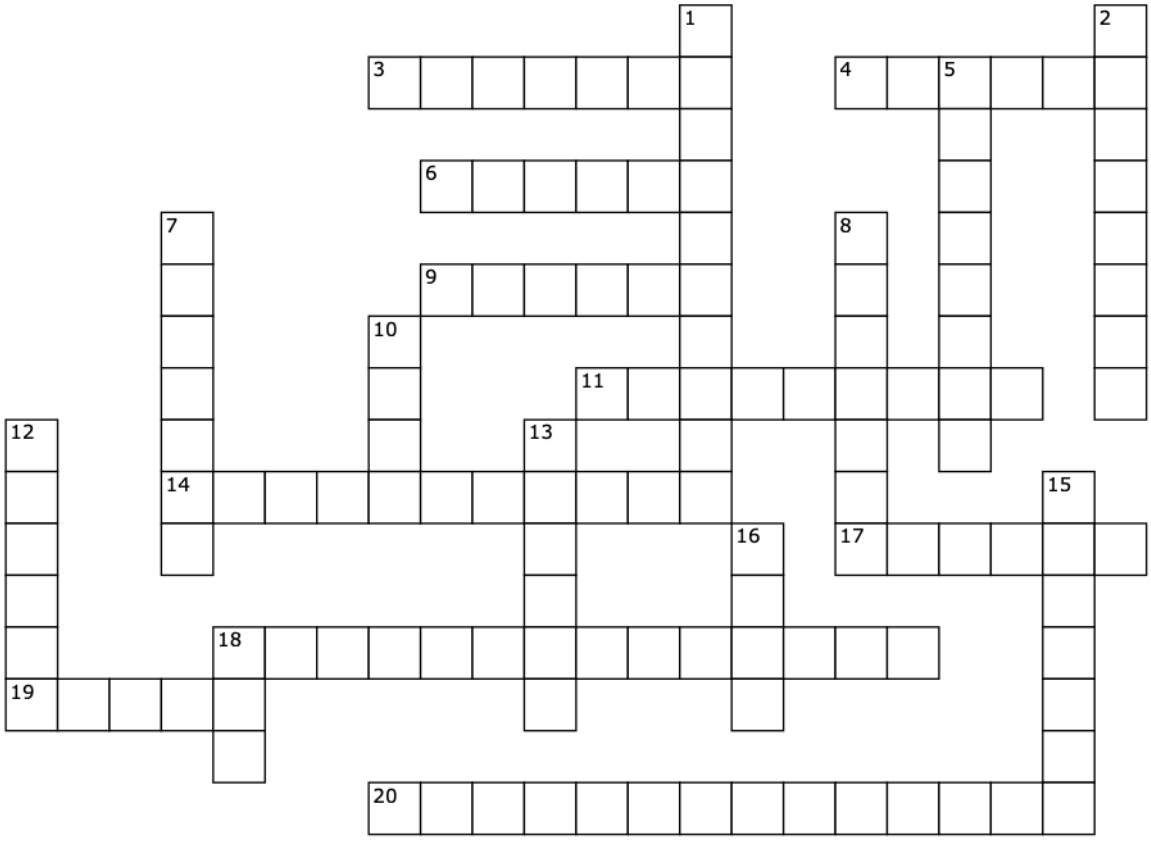
•	**Introduction/ Plan**	(9 marks)
•	**Investigation**	(21 marks)
•	**Analysis**	(9 marks)
•	**Evaluation**	(6 marks)
Total		45

Key words and phrases
Introduction needs AIM and choice of Investigations linked to ingredient properties.
Investigation shows how to complete the Task - method, changes, record of findings.
Analysis explains what the results mean.
Evaluation is the **conclusion** - and how results can be used in creating dishes.
Carry out a nutritional assessment.
Research on nutritional composition of ingredients
Methods of recording evidence - digital camera, **star profile**s, **sensory** analysis, nutritional data and taste testing.
Evidence - a report explaining investigation and findings, photographs or visual recordings.
Task needs a purpose.
Need to know assessment criteria and skills.
Students can collect secondary data without teacher supervision.
Learners can work together at this stage.
During research candidates can be given guidance.
Can alert to key things to be included.
Each learner must have their own report.

Key words - aim of **Investigation**, explanation linked to functional and chemical properties, logical sequence, use appropriate **food science** words.

Working characteristics - how the ingredient behaves, its performance or how it is used to its best advantage, when in a recipe cooked on its own, or as an accompaniment.
Functional properties - the purpose for which the ingredient is being used and can be linked to its structure, nutritional value, taste, texture, appearance, shelf life.

Investigation Crossword



ACROSS

3 An analysis that is done through tasting.
4 Gelatinisation happens when a ……. and liquid are heated.
6 A tuber starch.
9 The main nutrient in cornflour.
11 The thickness of a sauce.
14 Words to describe how a food tastes.
17 Protein formed when flour is mixed with liquid.
18 Process when starch breaks down when heated with water.
19 A grain starch.
20 The process that happens when a starch sauce is chilled.

DOWN

1 What you think will happen in the Investigation.
2 Raising agents that give off carbon dioxide gas.
5 Add information to a photograph or chart.
7 What happens when gas in a dough is heated.
8 Agents added to make mixtures rise.
10 A test that compares exactly the same things.
12 Shows as salt on a food label.
13 Type of flour used for bread.
15 Makes the golden colour when scones are baked
16 A shortening agent.
18 Rigid structure which is formed when cooked starch paste is cooled.

WORD BANK: Annotate, chemical, descriptors, dextrin, expands, fair, fats, gel, gelatinisation, gluten, hypothesis, maize, potato, raising, retrogradation, sensory, sodium, starch, strong, viscosity.

Student Assessment criteria for NEA 1

Checklist for Food Investigation Task NEA 1 (This is AQA marking scheme)		
Research 6 marks		Tick if done
	I've done some research from a range of sources.	
	I've described the **food science** I will be exploring.	
	I've investigated the working characteristics, function and chemical properties of ingredients in the Task.	
	I've planned my investigations.	
	I've written my **hypothesis** on what I think will happen in the investigation.	
Investigation 15 marks		
	I've carried out some **experiments** to find out how ingredients work.	
	I've written the Aim of the investigation based on my research.	
	I've recorded everything as I've worked on the **experiments** and changes I've made.	
	I've taken photographs and **annotated** them.	
	I've carried out **sensory** testing and **evaluate**d the results.	
	I've produced a chart to show the results of testing and **annotated** the charts.	
	I've written up the results in a range of ways.	
Analysis and Evaluation 9 marks		
	I've analysed and interpreted the results of the investigations.	
	I've linked the results to the working characteristics, function and chemical properties of ingredients.	
	I've **evaluate**d the **hypothesis** to see if it is correct or not.	
	I've written **conclusions** of the results of the **experiments** and used annotations.	
	I've thought about further investigations that could be done.	
	I've used **food science** words to explain the results.	
	I've shown how my research can be used to improve and understand my cooking.	
	I've written a report of between 1500-2000 words (6-8 sides A4) and included charts, photographs and **annotate**d work.	

This Assessment chart has the sections of the Task put into student friendly language.
There is no marking scheme for the sections at this point - to be added later.
You can add more rows if the exam board has more things to assess.
This Checklist can be used for Eduqas NEA 1 but change the marks to Research 5, Investigation 15, **Analyse and Evaluate** 10. For OCR NEA 1 Introduction 9, Investigation 21, Analysis 9, Evaluation 6.