

**GCSE (9–1)**

*Candidate Style Answers*

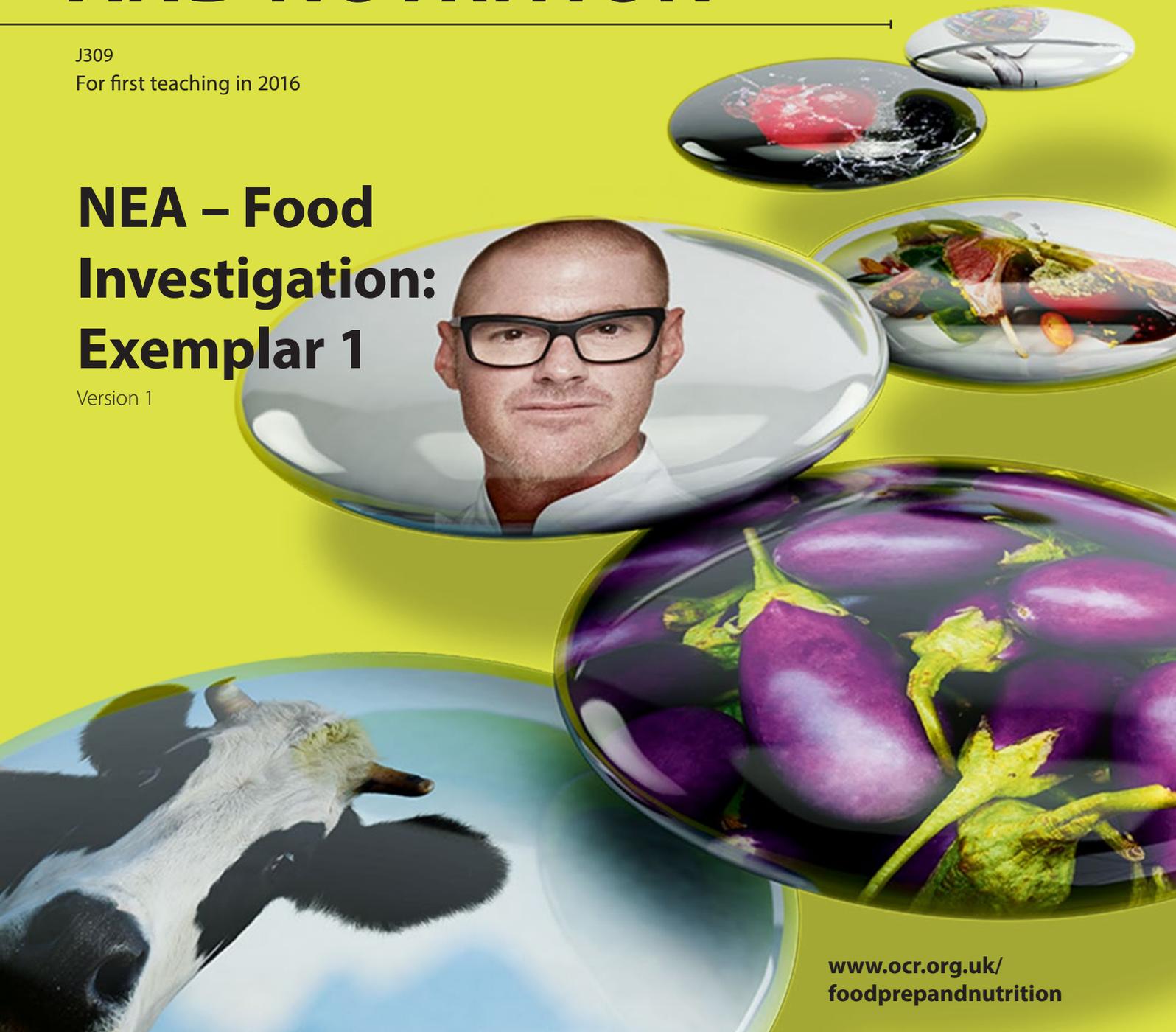
# ***FOOD PREPARATION AND NUTRITION***

J309

For first teaching in 2016

## **NEA – Food Investigation: Exemplar 1**

Version 1



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# Introduction

This work has been produced by Subject Advisors and Food teachers. The Principal Moderator and Chair of examiners have reviewed the exemplar.

As we currently do not have any access to standardised candidate work, this candidate style exemplar offers teachers an insight and guidance for completing the NEA: Task 1 Food Investigation.

The Commentary reflects the application of the making criteria. The exemplar indicates a high level of response.

Please note that this resource is provided for advice and guidance only and does not in any way constitute an indication of an endorsed approach to creating an NEA task.

This resource can be used in conjunction with the Student Guide, which can be found on the GCSE (9–1) Food Preparation and Nutrition web page.

# Task 1 – Food Investigation

**Candidates will be required to investigate, research and evaluate the working characteristics, functional and chemical properties of eggs (before carrying out the investigations).**

**Candidates are required to produce a written report of 1500–2000 words.**

**Eggs are a very versatile food.**

**Explore and scientifically investigate the changes that occur when eggs are used as a setting agent.**

**Explain scientifically what happens.**

## Aim

I aim to explore and scientifically investigate the changes that occur when eggs are used to set mixtures/ recipes and to explain scientifically what happens.

### Examiner commentary

**Aim – Clear and comprehensive aim. Relevant explanation linked to the chemical and functional properties of the ingredient – eggs.**

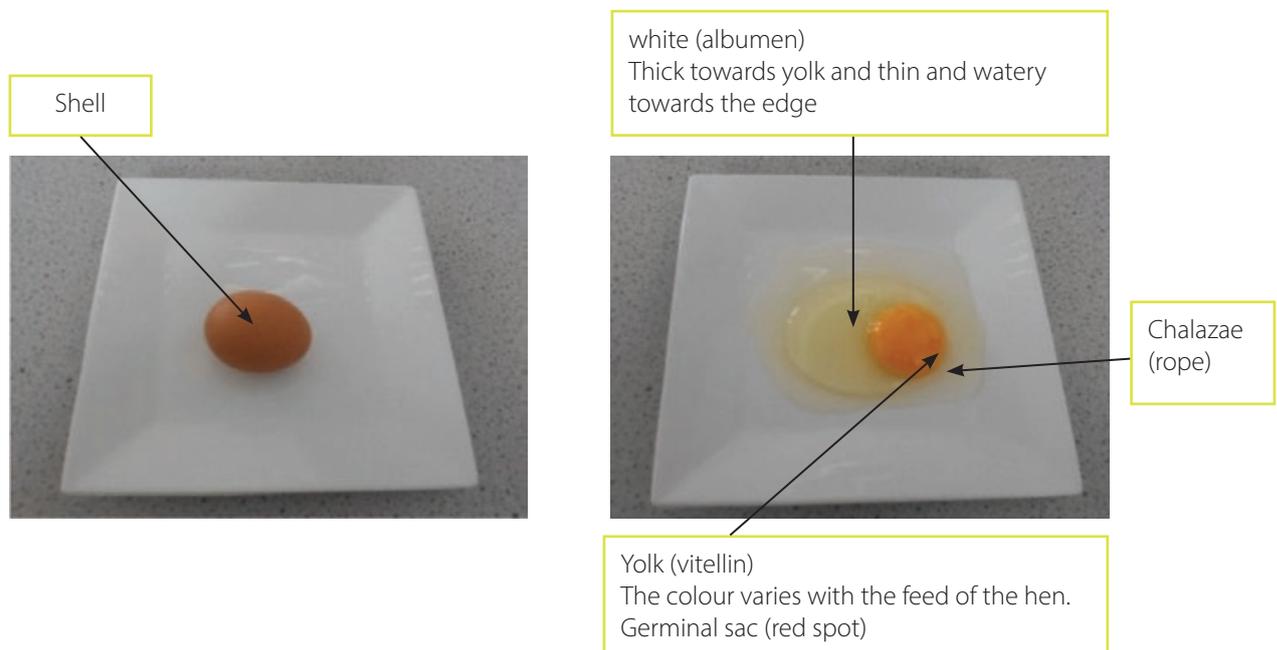
**Meets MB3.**

## Research

Before I start planning my investigations, I will find out about the structure and chemical composition and the working characteristics of eggs, so that I understand what happens when eggs set.

I am also going to research which recipes are set using eggs.

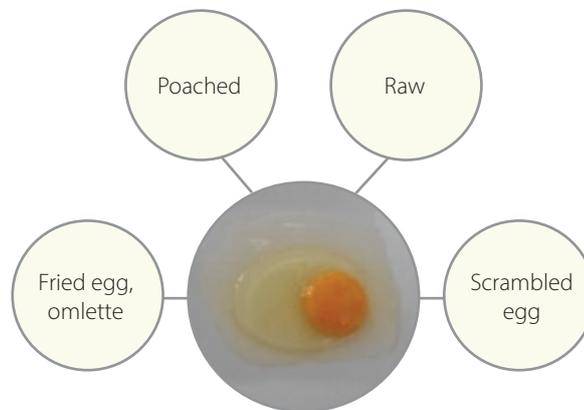
### Structure of eggs



## Nutritional data of egg using nutritional analysis

Eggs chicken, whole, battery, raw	
	per 100 g
Energy	612 kJ
	147 kcal
Protein	12.7 g
Carbohydrate	Trace
Total sugars	Trace
Fat	10.7 g
Saturated fat	3.1 g
Fibre	0.0 g
Sodium	0.1 g
Salt	0.4 g

I can see from this data that the largest nutrient (chemical) is protein 12.7g per 100g of raw egg. Then fat which is 10.7g and saturated fat which is 3.1g. I did some research to find out about proteins in eggs and found that there is a different type of protein in the white (albumin) than the yolk (vitellin).



- Egg combined with other ingredients
- Egg + milk
- Egg + milk + flour = batter
- Egg + milk + sugar = custard

The egg white makes up about 58% of the total egg. The egg white is made up of protein and water. The egg yolk makes up 31% of the total egg and is made up of water protein and fat and some minerals and vitamins.

## How an egg can be used as a setting agent (working characteristics).



Omelette,  
frittata,  
quiche,  
scrambled egg,  
pancakes,  
small cakes,  
lemon curd,  
egg custard,  
custard tart,  
meringues (egg white)

### Examiner commentary

**Research – Thorough research into the chemical and functional properties of eggs.**

**Evidence and diagrams supports the fact that the research is complete and thorough. Selection of recipes which reflect the functional properties highlighted in the task- eggs – setting.**

**Meets MB3**

## Investigations: Reasons for choice

I have chosen an egg custard recipe which I know is set using egg to investigate scientifically how and why the egg sets the mixture and which factors in the preparation and cooking of the egg custard will bring about functional and sensory changes.

My control recipe will be: 1 egg, 100ml milk and 25g sugar

### Examiner commentary

**Controls- demonstrates excellent evidence of scientific investigation using a controlled recipe.**

**Meets MB3**

### Possible investigations that I could do:-

1. Change the temperature for cooking the egg custard
2. Cook the egg custard in different ways (dry and wet heat, microwave, oven)
3. Combine the egg with different proportions of ingredients
4. Change the way the egg custard is prepared (process or technique): electric whisk, beat with wooden spoon.

I plan to do **three** investigations because it would be interesting and I want to find out how changing the temperature or cooking method and the recipe affects the setting and sensory appeal of the egg mixture. I will use equal amounts of each mixture and cook each mixture for the same amount of time for each method of cooking to ensure the experiment is fair. It is important that I use controls and these remain the same throughout the investigation.

### Examiner commentary

**Choice of Investigation – Clear succinct, comprehensive reasons for choice.**

**Meets MB3**

## Prediction

I predict that the egg will set because of the proteins in it. I think the best method of preparation will be mixing with an electric whisk because this will mean that the white and yolks are mixed thoroughly. I think that the best method of cooking will be a bain- marie because using this the eggs can be cooked at the perfect temperature and won't be overcooked.

### Examiner commentary

**Prediction - clearly explains what the candidate expects to happen, reflecting on research linked to the chemical composition and structure of eggs and investigation into different cooking methods.**

**Recommendation – This is comprehensive showing what is going to be investigated.**

**Meets MB3**

## Recommendations

I recommend using a basic egg custard mixture, 100ml of milk and 25g sugar with the egg to make a sweet egg custard mixture I will evaluate the results using some sensory analysis. If I find out which is the best way to set the egg, I can use this information when I make dishes such as quiche crème caramel and bread and butter pudding which uses a basic egg custard mixture.

My first investigation will be very simple. I am going to apply some heat to a raw egg to see what happens.

## Method

### Examiner commentary

**Method – evidence of excellent scientific investigation using a range of variables into the functional and working characteristics of eggs. Clear logical, accurate planning.**

**Meets MB3.**

	Investigation	Ingredients required	Equipment required	Cooking method
<b>Plan 1.</b>	Apply different temperatures to the egg	Egg	Frying pan Oven Food probe Recording sheet	Fry Crack egg into frying pan. Apply medium heat. Observe what happens to the egg yolk and white as it sets. Take readings with a probe Record results including relevant temperatures.
<b>Plan 2.</b>	Cook the egg in different ways: dry and wet heat  Bain marie @ 100°C 20 minutes Dry oven @ 100°C 20 minutes	1 egg 100ml milk 25g sugar	Glass ramekins Measuring scales Measuring jug Bain Marie Oven Food probe Recording sheet/ sensory testing sheet	Preheat the oven to 100°C Crack egg into jug Beat egg Add milk gradually Add sugar Take the temperature of the mixture before you begin Divide mixture equally into 2 ramekins Put the two ramekins into the oven set at 100°C, one dry and one in a bain marie After 20 minutes check the ramekins in the oven Observe what happens to the mixture and record results including organoleptic qualities (aroma, texture/ mouth feel, taste/flavour and appearance)
<b>Plan 3.</b>	Combine the egg with different proportions of other ingredients: sugar	1 egg, 100ml milk 45g sugar	Glass ramekins Measuring scales Measuring jug 2 bowls Bain Marie Oven Food probe Recording sheet/ sensory testing sheet	Add 10g and 35g of sugar to 2 different mixtures. Preheat the oven to 100°C Crack 1 egg into jug Beat egg Add 100ml of milk gradually Divide mixture equally into 2 bowls Add 10g of sugar to one bowl and pour into ramekin Add 35g of sugar to one bowl and pour into ramekin Take the temperature of the mixture before you heat Put the two ramekins into the oven set at 100°C

## Report evidence

### Examiner commentary

**Report evidence – The candidate demonstrates excellent recordings of observations and findings using, tasting/  
sensory charts, ranking tests, star profiles and photographs. A comprehensive range of formats has been used.**

**Meets MB3**

Sensory analysis chart for plan 2 and 3				
Texture	A: Dry heat 100°C 20 minutes	B: Wet heat 100°C 20 minutes	C: 10g of sugar 100°C 20 minutes	D: 25g of sugar 100°C 20 minutes
Taste	Smooth with some openness. Slightly bubbly	Very smooth, almost velvety. No openness. Close	Smooth with some openness. Slightly bubbly	Very smooth, almost velvety. No openness. Close
Appearance	Sweet, creamy and slightly dry	Sweet, creamy, moist	Slightly sweet, creamy and slightly dry	Sweeter, creamy, moist
Aroma	Eggy	Eggy	Eggy	Eggy, sweet

**Ranking Test:** 1 to 4

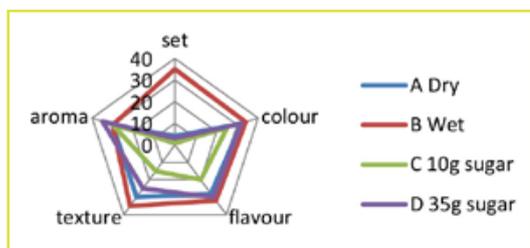
(4 is best and 1 is least)

Control Dry oven 100°C 20 minutes

Overall quality	
A: Dry heat 25g of sugar	2
B: Wet Heat 25g of sugar	4
C: 10g of sugar	1
D: 35g of sugar	3

**Star Profile:**

This shows clearly the overall best investigation relating to setting, texture, flavour, aroma and colour.



**Investigation 1: Fry**



I found that the egg white (albumen) began to set at 60°. The egg white changed from transparent to opaque



I found that the egg yolk began to set at 70°

**Investigation 2: Wet and dry heat**



**Analysis**

Examiner commentary

**Analysis** –The candidate shows a clear understanding of what has happened and why, showing a wide range of viewpoints. The candidate was able to apply their knowledge throughout and make conclusions about the best method of cooking. Scientific terminology has been used to explain results. The candidate clearly understands the functional, chemical and working characteristics of eggs.

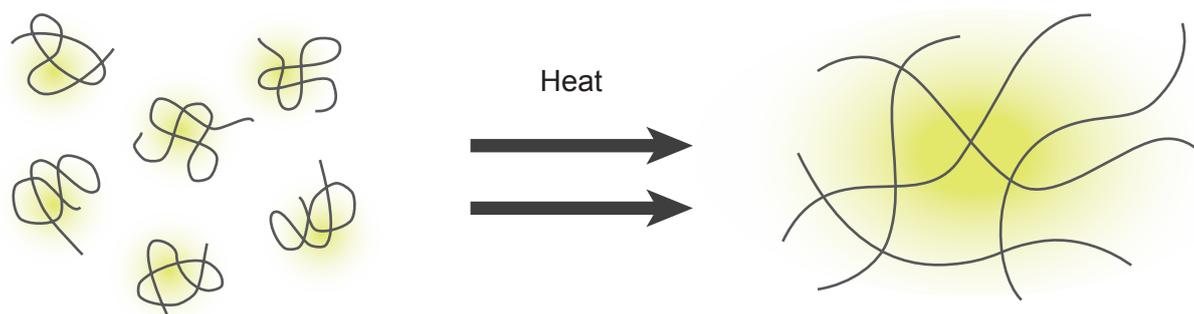
Meets MB3

From my research and investigations I have found out that proteins in eggs denature when we cook eggs. The egg sets, this is called **coagulation**.

Coagulation happens when the protein in eggs changes from a liquid state to a solid form. Once proteins are coagulated, they cannot be returned to their liquid state. From my investigations I found out that coagulation begins around 38°C and is complete between 71°C and 82°C.

In my investigations when moist or dry heat was applied to the egg custard mixture the protein in the egg coagulated (set). Investigation 1, I observed that the egg white begins to coagulate at 60° C. The egg white changed from transparent to opaque. The egg yolk begins to coagulate at 70° C. If the egg is heated too quickly the liquid from the egg separates out and the protein becomes tough. This is called syneresis. I have seen this when I have over-cooked scrambled egg.

Because I understand that eggs are made up in part of the chemical protein, I can explain what happens to the proteins in the egg. The proteins albumin and vitellin change chemically when heated. In a raw egg the long protein molecules are coiled, as we heat them the chains begin to unfold, this process is called **denaturation**.



proteins that are uncooked

network of cooked proteins

Denaturing is also caused by acids on protein and by mechanical whisking.

My sensory analysis shows that the most effective investigation for cooking the egg custard was the wet cooking. This is shown because it scored highest for set, texture, taste and appearance for all cooking methods. Although this made the dish slightly denser it was preferred. Using the Bain Marie allowed a good texture to be created because the egg was heated no higher than the temperature needed to coagulate the egg. This gentle method of cooking allowed the egg proteins to denature changing the texture of the egg without the danger of the egg splitting and curdling. The texture in the Bain Marie egg custard was much creamier with a glossy appearance making it much more appealing.

## Evaluation

### Examiner commentary

**Evaluation- This candidate demonstrates an excellent evaluation and review of findings using a wide range of evidence to draw appropriate conclusions related to the task. The candidate extended and communicated their understanding of the functional properties of other ingredients in the recipe.**

**The candidate was able to apply the knowledge learnt to future cooking.**

The results show how eggs set (coagulate) at certain temperatures and using different methods of cooking. Using the knowledge and information I have gained from doing this investigation, I could apply this to my future cooking. When I make dishes such as bread and butter pudding and crème caramel, I will apply my understanding.

Higher temperatures are used in dry methods of cooking, compared with moist methods. Sometimes moisture may be added to help develop certain textures in a food, for instance placing egg custards in a (bain-marie) to prevent them curdling. If I made a crème caramel or a bread and butter pudding I would cook these in a bain- marie to get a nice smooth velvety texture. I would cook these dishes at a controlled temperature between 100C and 140C.

The sugar in my egg custard mixture also made a functional change.

The sugar helped to make the custard sweet and the texture smooth. At 84C sugars start to dissolve and infuse into the mixture making the egg custard smell and taste sweet.

The effect of the dry method of cooking caused some browning around the edges of the dishes. This was because the sugar started to caramelize.

This demonstrates that other ingredients in the egg custard apart from the egg in the mixture have a job or functional property. I have discovered that you need to heat custard slowly, without overheating it, to stop the denaturation happening too quickly or going too far.

I can conclude that another way to slow down coagulation and denaturation apart from changing the cooking method is to add sugar. This makes the texture of the custard smoother and creamier.

I could have expanded my investigations further and looked at changing the other ingredients in the recipe, such as changing the milk for cream, or adding flavours. I could also think about changing the proportions of the control ingredients.

I would also be interested to see what scientific changes microwave cooking might have on the texture and flavour of my egg custard mixture.

Also, after researching further I found a recipe by Heston Blumenthal for scrambled eggs, using milk, cream, eggs and butter. I can now understand the theories behind his choice. I understand that the proteins in the egg help thicken and set the dish, the cream helps the flavour. The milk adds the sugars and dilutes the mixture making it less dense and the butter cools the mixture when added as well as adding flavour.

I would predict that when cream and milk are used in this recipe the best way of cooking the mixture would be in a bain marie or double saucepan. Both ingredients begin to change at 82°C and this method of cookery will allow them to reach this temperature without overheating.

A double saucepan consists of two saucepans, one fitting inside the other. The bottom saucepan contains water and it cooks the food more gently which will be better for some egg set mixtures.



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