

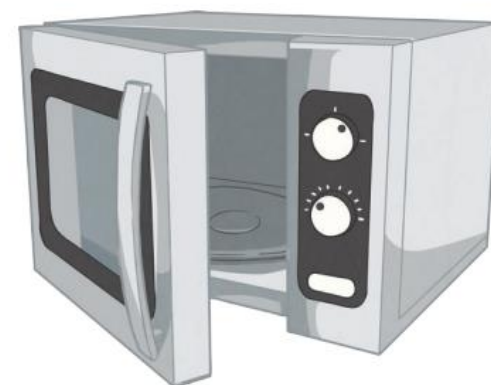


## The Effect of Cooking on Food Knowledge Organiser

Key Terms	Description	Example	Use
<b>Conduction</b>	Transfers heat from a hot surface.	bacon, sausages, welsh cakes, pancakes	dry fry, sautéing, searing, griddling
<b>Convection</b>	Transfers heat by the mass movement of heated particles into a cooler mass area.	chicken stew, boiling potatoes, poached eggs, deep fried fish	baking, roasting, deep frying, boiling, braising, simmering
<b>Radiation – Infrared</b>	Heat transferred using electromagnetic radiation – waves of heat or light strike the food.	meats cooked on a barbecue	infrared barbecues
<b>Radiation – Microwave</b>	Electricity is converted into radio waves, called microwaves, which penetrate the food.	ready meals, microwave meals,	heating leftovers, defrosting, ready meals

We cook food for a variety of reasons:

- soften the food;
- improve or intensify flavor;
- make it look appealing;
- reduce 'bulk';
- provide variety;
- enable ingredients to work together;
- keep warm/comfortable in winter;
- make food safe to eat;
- kill pathogenic bacteria;
- make food easier to chew and swallow;
- expend less energy in digestion.





## The Effect of Cooking on Food Knowledge Organiser

### Dry Heat Methods

Method	Explanation	Advantage	Disadvantage	Example
<b>Baking</b>	Food is cooked in the oven using dry hot air.	More than one item can be cooked at once; good colour and texture; exterior is browned and adds flavour.	Specific cooking times needed; needs to be baked at correct temperature.	cakes, puddings, bread, biscuits
<b>Roasting</b>	Food is cooked using dry air in the hot oven. Basting with fat prevents the food drying out.	Good flavour; crisp texture; other products can be cooked at the same time.	Can be time-consuming; meat can get chewy and hard if cooked at too high a temperature.	joints of meat
<b>Grilling</b>	Food is cooked by radiant heat – grill is either above or below the food.	Healthy – fat drains off quickly.	Can easily burn if left too long.	sausages, bacon, cheese on toast
<b>Toasting</b>	Dry radiant heat is applied – brief exposure to heat from an oven.	Toasting lowers Glycemic Index; flavours can be enhanced.	Needs monitoring to avoid burning.	bread, nuts, seeds, spices

### Frying Methods

Method	Explanation	Advantage	Disadvantage	Example
<b>Shallow Frying</b>	Food is cooked in a shallow amount of hot fat.	Quick; uses minimal fat.	Will cook small pieces of food only; high safety risk – splashes can cause injury and fire.	chicken, steak, sausages, vegetables
<b>Deep Frying</b>	Food is plunged into very hot fat.	Gives a golden appearance and crunch; very quick.	High safety risk due to overheating causing fire; Very unhealthy – foods absorb fat.	chips, , chicken pieces, fish
<b>Stir Frying</b>	Small pieces of vegetable and meat are cooked quickly in a small amount of hot oil.	Quick cooking method; vegetables remain crunchy.	Food needs to be kept moving to cook through; heavy preparation needed before cooking.	thin strips of meat, fish and vegetables

### Moist Heat Method

Method	Explanation	Advantage	Disadvantage	Example
<b>Boiling</b>	Food is cooked in boiling water.	Quick; Healthy; No added fat; Good for starchy foods.	Water soluble vitamins can be lost; food can get soft; not suitable for meat.	potatoes, rice, pasta
<b>Simmering</b>	Food is cooking in a lightly bubbling stock, water or juice.	Good for tender pieces of food Quick.	Water soluble vitamins can be lost; tender foods can fall apart.	meat, fish, eggs, fruits, vegetables
<b>Poaching</b>	Food is cooked in a small amount of simmering liquid – usually water or milk.	Food is cooked gently; Quick; Healthy.	Water soluble vitamins can be lost; food can fall apart.	fish, eggs, meat
<b>Stewing</b>	Food is cooked slowly in a liquid to develop flavours.	Tough meat is tenderised; Water soluble vitamins are absorbed into the sauce.	Needs planning – can take 2-3 hours.	stew, casserole, fish, meats, pulses, vegetables
<b>Braising</b>	Meat has been seared and added to vegetables in a liquid to be cooked in the oven.	Meat is tenderised; Good flavour; Water soluble vitamins are absorbed into the sauce.	Must have a well fitted lid; can take 1-2 hours.	meat, beans, vegetables
<b>Pressure Cooking</b>	Cooked under pressure in a pressure cooker – temperature of liquid rises quickly from 100-120°C	Food cooks quickly; Meat is tenderised; Water soluble vitamins are not easily lost.	Easy to overcook the food.	meat, vegetables, soup, rice, steamed puddings
<b>Steaming</b>	Food cooked in the steam of boiling water.	Healthy; Water soluble vitamins are not lost; Food easy to digest.	Steamer needs supervision and filling up; can take longer than boiling.	meat, fish, vegetables
<b>Blanching</b>	Food plunged into boiling water, then removed and put into cold water.	Healthy; Can prepare vegetables for freezing; Protects the loss of colour.	Vitamins and minerals can be lost.	leafy vegetables
<b>Sous Vide</b>	Food is vacuum-packed and heated in water.	Flavour, aroma and nutrients are preserved.	Water bath machine is expensive; food does not brown.	meat, fish



## The Science of Food: Raising Agents Knowledge Organiser

Mechanical Raising Agents	Action	Uses
Sieving	Traps air in between the flour particles.	cakes, pastry, batter
Whisking	Whisking eggs will trap air and create a foam.	meringues, cakes, mousse, sponges
Rubbing in	Rubbing fat into the flour adds air.	pastry, cakes
Creaming	Mixing fat and sugar together traps air – fat becomes pale and mixture is creamy.	cakes, sponges
Lamination	Air is trapped in each layer when it is rolled and folded.	flaky pastry, rough puff pastry

Chemical Raising Agents	Action	Uses
Bicarbonate of soda	With moisture and heat, the bicarbonate creates bubbles of carbon dioxide which raises the food. This can have a soapy flavour.	chocolate cake, gingerbread
Baking powder	A mixture of baking powder and cream of tartar works in the same way as bicarbonate of soda but with a reduced 'soapy' flavour.	Provides an 'all in one' method of baking when 'creaming' isn't done to add air.
Self-raising flour	Plain flour with baking powder added removes the need to add a raising agent individually.	cake recipes
Creaming	Mixing fat and sugar together traps air – fat becomes pale and mixture is creamy.	cakes, sponges
Lamination	Air is trapped in each layer when it is rolled and folded.	flaky pastry, rough puff pastry

### Raising Agents

Used in baking to give a risen, light and airy texture in the food.



Physical Raising Agents	Action	Uses
Steam	Cooking a mixture with a lot of liquid in a very hot oven. Water turns to steam, which causes food to become solid and rise.	Yorkshire pudding, choux pastry





## The Science of Food: Raising Agents Knowledge Organiser

### Heat Control

Oven	<ul style="list-style-type: none"><li>Food can spoil if the correct temperature is not used.</li><li>If cake browns too quickly, reduce the heat by one gas mark or 10°C.</li></ul>
Hob	<ul style="list-style-type: none"><li>Water boils at 100°C.</li><li>Oil and fat can catch fire if they become too hot (between 180 and 250°C).</li></ul>
Grill	<ul style="list-style-type: none"><li>The element should be red before grilling food.</li><li>Food must be monitored to check it doesn't burn but cooks through.</li></ul>

Biological Raising Agent	Action	Uses
Yeast	<p>Yeast is a living organism that can be bought fresh or dried.</p> <p>With moisture, food, oxygen and time, yeast will produce carbon dioxide bubbles. These cause bread dough to grow and rise.</p> <p>After kneading, dough will be left to prove to allow yeast to become activated.</p> <p>As dough rises, the gluten becomes stretchy, resulting in the dough being soft and springy.</p> <p>Some bakers knock back the dough and allow it to have a second rise for a finer texture.</p>	doughs, breads

### Troubleshooting

Problem	Cause	Products This Can Affect
The mixture is stodgy, dry and stiff.	too much flour	cakes, breads, biscuits
The mixture lacks volume, is too runny or too soft.	too little flour	baked products and sauces
The product has a rubbery, greasy possibly crunchy texture.	too much fat	all food products
The product is dry and lack flavour.	too little fat	baked goods
Food is too brown and sweet. Texture is crunchy, crisp and brittle.	too much sugar	baked goods
The product lacks flavour and volume.	too little sugar	baked goods and desserts
The product tastes 'eggy' or has a dense texture.	too much egg	baked goods
The product has not set/has little coagulation.	too little egg	cakes, custard, quiche
The consistency is too runny for a batter or sauce.	too much liquid	baked goods and sauces
The mixture is very dry.	too little liquid	baked goods and sauces
The cake surface is cracked, or the cake has risen over the tin.	too much raising agent	bread, biscuits, cake
The product hasn't risen at all and is very dense.	too little raising agent	bread, biscuits, cake

### What Do Ingredients Do?

Ingredient	Purpose
Flour	<ul style="list-style-type: none"><li>provides bulk and volume;</li><li>thickens liquids (gelatinisation).</li></ul>
Fat	<ul style="list-style-type: none"><li>adds flavour, colour and moisture;</li><li>traps air.</li></ul>
Sugar	<ul style="list-style-type: none"><li>adds flavour, colour and texture.</li></ul>
Eggs	<ul style="list-style-type: none"><li>adds flavour, colour and air;</li><li>helps set the liquid (coagulation).</li></ul>
Baking powder	<ul style="list-style-type: none"><li>produces carbon dioxide bubbles, resulting in cakes being able to rise.</li></ul>
Yeast	<ul style="list-style-type: none"><li>produces carbon dioxide bubbles, resulting in bread dough being able to rise.</li></ul>



## The Effect of Heat on Food Knowledge Organiser

Key Term	Explanation
denature	Altering protein structure or properties through heat, enzyme or chemical.
coagulate	Change of protein from liquid to solid (irreversible).
foams	Mousse, whipped cream, cappuccino foam.
gluten	The protein found in wheat flour.
caramelisation	Browning of sugar and changing of its flavour when heated.
dextrinisation	Starch breaks down into dextrin in dry heat.
gelatinisation	Starch swells and thickens.
plasticity	Ability to be shaped.

### Heat Effects on Proteins

#### Gluten

When water is mixed with flour, it forms a dough. As the dough is kneaded, it wakes up the gluten which becomes stretchy and strong.

When it reaches a high temperature, it coagulates whilst keeping the dough stretched. This forms a well risen bread with a light airy texture.

#### Foams

Foams are formed when air is trapped inside the liquid. If air is then allowed to coagulate (whisking egg whites), it will form a foam. Over-whisking will allow air to escape and foam will collapse.



### Heat Effects on Proteins

During cooking, protein denatures and coagulates. Heat causes loss of moisture, shrinkage and the product to become firm. Most proteins coagulate between 71-85°C.

Examples of protein reacting with heat:

- egg whites changing from clear liquid to solid;
- meat fibres becoming firm;
- wheat proteins in bread (gluten) changing during baking.

#### Denature

This is when proteins unravel and their chemical bonds break down.

Ways in which proteins can be denatured:

- **physical** – whisking, beating and kneading;
- **changing their temperature** – heating, freezing;
- **adding chemicals** – acids, lemon juice and marinades.

#### Coagulate

This means water becomes trapped in between the protein molecules which have been broken down. Coagulation happens when proteins are denatured and changes appearance and texture of food.



## Heat Effects on Carbohydrates

### Gelatinisation

The change in starch is called gelatinisation. When starch and liquid are heated together, starch granules absorb water to soften and swell. This occurs at 66°C and above.

The thickness of a starch-based sauce depends on the ingredient ratio. It must be stirred continuously to prevent lumps forming.

When cooled, the liquid solidifies, e.g. lemon pie filling.

### Dextrinisation

This is a chemical change to the starch molecule caused by the breakdown of sugars. It gives food a browner colour, crispier texture and different taste.

The longer food is cooked, the more starch is converted into dextrin, resulting in a darker and crispier food.

### Caramelisation

As sugar is heated, it first turns runny and very sweet, followed by becoming a caramel and sticky. As it cools, it solidifies into a solid candy.

Most heat methods cannot get the sugar at a high enough temperature, therefore it is caramelised through the dry heat method.



## Heat Effects on Fats - Plasticity

Fat cannot evaporate; it softens and liquefies when heated. However, different fats melt at different temperatures, meaning a variety of fats are used for different processes.

The more plasticity a fat has, the easier it is to spread. Unsaturated fats tend to be softer than saturated fats and therefore have more plasticity.

The plasticity of fat has many uses:

- decorating cakes with buttercream;
- rubbing fat into flour to make pastry;
- spreading butter on toast;
- cream cheese on crackers.

## Heat Effects on Water - Evaporation

- Some foods are made up of almost entirely water.
- As these foods are heated, the molecules move faster until the water turns into steam and evaporates.
- When too much water evaporates from food, it causes it to become dry.