

**Key words:**

**Conduction:** transferring heat through a solid object into food

**Convection:** transferring heat through a liquid or air into food

**Radiation:** transferring heat by infra-red waves which heat up what they come into contact with food

**Conduction:**

Atoms in metal pans and baking trays start vibrating as heat energy from cooker goes into metal. Vibrations transfer heat energy to other metal atoms.

Metal gradually heats up and passes heat energy to food. Metals are good conductors of heat .

**Convection**

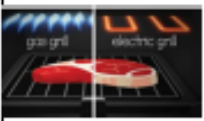
When a pan of water is heated, heat is conducted through the metal pan to water molecules. These move upwards then downwards in circular motion (convection currents) taking heat energy with them and passing it into the food. The more heat energy, the faster the water molecules move in circular convection currents. Also happens in oven with hot air currents. Gas oven/ordinary electric oven have zones of heat: hotter at top than bottom shelf due to convection. Electric fan ovens – heat evenly distributed by fan – same temperature on each shelf.

**Radiation**

Grilled/barbecued food heated by radiant heat. Infrared heat rays heat the surface of the food and are absorbed. Food must be no more than 3.5cm thick otherwise may be undercooked inside which could be a food poisoning risk . Food must not be too close to grill or it may burn easily.

**Why is food cooked?**

- **To make food safe to eat** – Some foods must be thoroughly cooked to destroy the food poisoning bacteria they could contain. – Some foods contain natural toxins (poisons) which would be harmful if the food was eaten raw e.g. raw red kidney beans. Cooking destroys the toxins and makes the food safe to eat.
- **To develop flavours in the food** – Cooking develops flavour by causing chemical reactions to take place in the food e.g. gelatinisation and intensifying flavour by causing water to evaporate
- **To improve the texture and appearance of food**, and make it easier to eat, swallow and digest. Cooking causes starch granules to swell, gelatinise and thicken or soften a food . Cooking softens the structure of the cells in vegetables to make them less bulky and easier to eat – Cooking tenderises meat. This means the cooking process softens the meat so that it is easy to chew and digest.
- **To improve the shelf life of food** – Cooking destroys harmful micro-organisms such as bacteria and moulds, which preserves the food (makes the food last longer)
- **To give people a variety of foods in their diet** – Foods can be cooked in different ways to give variety, for example, eggs can be fried, soft or hard boiled, scrambled, poached, used in quiches, eggs Benedict .

Dry heat	Moist (in liquid)	In oil
Baking in oven	Boiling: Cooking food in water at 100°C	Roasting: In oven in hot fat
Grilling/toasting	Simmering: Cooking food in small quantities of liquid at just under boiling point.	Sautéing: Pan frying in hot fat
Dry frying in no added oil	Stewing: slow-cooking on hob or in slow-cooker with liquid	Stir frying in little fat over high heat
	Poaching: Cooking in water	Deep fat frying
	Steaming: Cooking food over boiling water.	Shallow frying: Frying in a small amount of oil
	Braising: Slow-cooking pre-sealed meat + veg. in oven with liquid	
<b>Other</b>		
Induction cooking		Micro waving

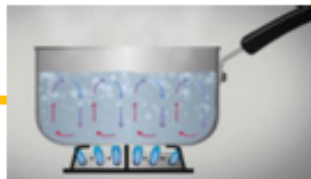
**Heat Insulators**

These are used to protect us from burning ourselves when cooking. E.g.

- Pan handles are plastic or wood making them comfortable to hold
- Hollowed metal pan handles allow the air to protect them from becoming too hot
- Wooden and silicone utensils protect us.
- Use insulated pan stands made from wood, cork, ceramics or

metal to protect work surfaces

- Wearing oven gloves because these are made of thick,



**Retaining water soluble vitamins: B and C**

- Do not prepare veg too far in advance; vitamin C will be exposed to oxygen and lost when it is cut or peeled. • Put veg. into a small amount of boiling water so they cook quickly; vitamin C and B vitamins will be lost in the water. • Cook all veg. for the minimum amount of time to minimise the damage by heat to vitamin C and B vitamins. • Steaming veg will reduce the loss of vitamin C and B vitamins to cooking water. • Serve the vegetable cooking water in the gravy to conserve some of the vitamins that have gone into it. • Do not prepare fruit too far in advance, to preserve the vitamin C. Add lemon juice to prevent enzymic browning and add acid to help stabilise vitamin C (ascorbic acid). • Keep the fruit cold and in a box to minimise its exposure to oxygen and conserve the vitamin C


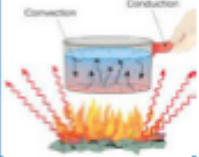

**Methods of cooking 2.1.2**

**Key words:**

**Heat transfer:** the way in which heat energy is transferred into food

**Palatability:** what makes a food acceptable and good to eat

**Sensory qualities:** The characteristics of a food that give it particular appearance, flavour, texture and aroma (smell)

Cooking methods	Method of heat transfer	Effects and scientific principles on ingredients	Effects on sensory qualities and Effect on nutrients
<p>Moist cooking methods—water is used to transfer heat energy to food:</p> <ul style="list-style-type: none"> <li>•Boiling</li> <li>•Braising</li> <li>•Poaching</li> <li>•Simmering</li> <li>•Steaming</li> <li>•Stewing</li> </ul>	<p>Conduction ↓ Convection</p>	<ul style="list-style-type: none"> <li>•Starch absorbs water and gelatinises</li> <li>•Proteins denature and coagulate</li> </ul> <p>Fat melts</p> <ul style="list-style-type: none"> <li>•Water evaporates—thickening or reducing sauces</li> <li>•Colour change e.g. meat red to brown</li> </ul>	<p>Vegetables, fruit, pasta, rice tenderise Meat tenderises (collagen converts to gelatine) BUT can become tough and indigestible if overcooked Flavour intensifies</p> <p>Vitamins B1, B2 and C dissolve in water and are gradually destroyed by heat</p>
<p>Methods where oil is used to transfer heat energy to food:</p> <ul style="list-style-type: none"> <li>•Sautéing</li> <li>•Shallow/pan frying</li> <li>•Stir frying</li> <li>•Roasting</li> <li>•Deep fat frying</li> </ul> 	<p>Conduction ↓ Convection</p> 	<ul style="list-style-type: none"> <li>•Intrinsic (natural) sugar caramelises and make food go a golden colour e.g. sautéed onions</li> <li>•Starch absorbs oil and swells</li> <li>•Protein denatures and coagulates</li> <li>•Meat shrinks and squeezes out juices</li> <li>•Energy density of foods is increased because oil is absorbed into the food</li> </ul>	<ul style="list-style-type: none"> <li>•Food flavour intensifies as water evaporates</li> <li>•Vegetables/fruits soften</li> <li>•Foods become crisp on the outside – especially if coated with egg and breadcrumb to protect the food from the heat of the oil</li> </ul> <p>Vitamins B1, B2 and C are gradually destroyed by the heat of the oil</p>
<p>Methods where dry heat is used to transfer heat energy to food:</p> <ul style="list-style-type: none"> <li>•Baking</li> <li>•Grilling</li> <li>•Toasting</li> <li>•Dry frying</li> </ul> 	<p>Baking: •Conduction •Convection</p> <p>Grilling: •Radiation</p> <p>Dry frying: •Conduction</p>	<ul style="list-style-type: none"> <li>•Gases from the raising agents used expand and make food rise</li> <li>•Starch on the outside changes to dextrin and goes brown</li> <li>•Protein denatures and coagulates – overcooking squeezes out too much moisture and makes it indigestible</li> <li>•Meat proteins in muscle shrinks and squeeze out juices</li> <li>•Free sugars dissolve and soften the gluten in the flour</li> <li>•Sugars caramelise</li> <li>•Fat melts and is released from meats – reducing the energy density</li> <li>•Starch granules absorb water/fat swell and soften</li> <li>•Gluten stretches as doughs rise and then sets (coagulates) around gas bubbles</li> </ul>	<ul style="list-style-type: none"> <li>•Starch becomes more digestible</li> <li>•Flavours of food intensify</li> </ul> <p>Vitamins B1, B2 and C are gradually destroyed by the intense heat</p>
<p>Microwaving</p> <p>~electromagnetic waves vibrate water molecules in food</p> <p>~this produces heat energy which is transferred very quickly to the rest of the food</p>	<p>•Radiation:</p>	<ul style="list-style-type: none"> <li>•Protein denatures and coagulates quickly</li> <li>•Fat melts</li> <li>•Sugar caramelises and will burn easily</li> <li>•Starch gelatinises</li> <li>•Juices and water from meat are easily squeezed out</li> </ul>	<ul style="list-style-type: none"> <li>•Protein will quickly overcook and become tough and indigestible</li> <li>•Sugars quickly caramelise and then carbonise</li> </ul> <p>A little damage to vitamins B1, B2 and C</p>
<p>Using an induction hob:</p> <ul style="list-style-type: none"> <li>•Boiling</li> <li>•Frying</li> <li>•Poaching</li> <li>Stewing</li> </ul>	<p>•Conduction</p>	<p>Same as moist</p>	<p>Same as moist</p>



