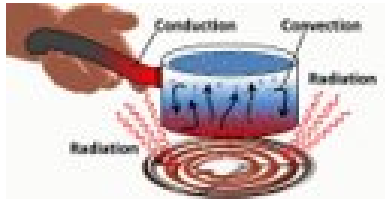
Term 3 – Food preparation and Nutrition: Year 10

Why food is cooked?

To improve digestion	During cooking proteins and carbohydrates, including fibre, undergo chemical processes which make them easier to breakdown.
To improve taste	During cooking, chemicals undergo changes which alter their flavour. Also addition of other ingredients, spices and herbs to obtain a variety of flavours e.g. marinading meat or fish.
To improve texture	Cooking includes processes such as caramelisation, dextrinisation and denaturation. These help to obtain the required texture of food e.g. rice softens when cooked.
To improve appearance	During cooking, chemicals in food undergo a number of changes which change the appearance of food e.g. bread goes golden.
To avoid contamination	High temperature helps to kill most of the pathogenic bacteria which usually occur on various foods making them safe to eat.

How is food cooked?

Conduction: Direct transfer of heat from the saucepan to the food inside. **Heat makes metal particles vibrate → vibrations of the metal are transferred to the particles of the food → food particles vibrate and the meal heats up.** Example: melting butter in a pan.



Radiation: Indirect transfer of heat through heat waves. **Microwaves send electromagnetic waves, which heat up water particles in the food → water particles begin to vibrate and therefore, heat up the whole meal.** Infrared radiation is used in grills and BBQs. Example: Microwaving soup.

Most dishes require the use of various cooking methods to obtain the desired effect (texture, taste, appearance etc...) For example:
Baking: radiation → conduction → convection
Braising: conduction → convection → conduction
Steaming: conduction → convection

Convection: Indirect transfer of the heat through the water or air. Convection current makes the hot air/steam go up while the cooler air falls. Example: Boiling eggs.

Signs of food spoilage

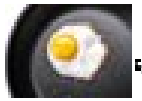
	Bacteria	Yeast	Mould	Enzymes
Food Spoilage	Clostridium botulinum produces a toxin which causes meat preserves to bulge. Bacteria can also make meat products look slimy and green in colour	Ferments sugar in juices and beverages, making them sour, fizzy and foamy	Create green, white or black coat on food products such as bread, grapes, tomatoes and jams	Turn bananas, apples, potatoes and other foods brown

What happens when food is cooked?

Proteins

Proteins are macromolecules that are built of thousands of amino acids bonded together into long chains
Amino acids —> peptides —> polypeptides

- Heat causes **denaturation** of proteins. Proteins vibrate quickly and as a result hydrogen bonds in them rupture.
- **Coagulation** of proteins. Aggregation of protein particles into larger lumps, causing it to set e.g. cheese becoming rubbery when overcooked or eggs becoming solid when cooked.
- **Syneresis** is leakage of water from overcooked (and over coagulated) proteins. Usually associated with eggs
- **Gluten formation.** Where two simple proteins cross-link, creating a net which holds bubbles. E.g during proving or baking.



During cooking, the protein in Eggs coagulates and denatures, and causes the eggs to set.

Fruit and Vegetables

Cooking can have a large impact on nutritional value, appearance, flavour and smell of food products.

Enzymatic Browning
Involves the discolouration of fruits and vegetables as a result of oxygen reacting with enzymes and plant cell substances.

Cutting, shredding, grating, biting, peeling, etc.
→ Of cell vacuoles (spaces) and cytoplasm (outside of vacuole)
→ Enzymes from the cytoplasm are activated by oxygen from air and mix with the substances from the vacuole
→ Corrosive effect (brown colour and vitamin loss)

Foods most prone to enzymic browning:
- Fruit: avocados, bananas, peaches, pears, apples, mangos, apricots, plumbs, grapes
- Vegetables: aubergines, mushrooms, potatoes, lettuce

The process can be slowed down or accelerated...

Slowed down by:
- lowering temperature
- inactivating enzymes with the use of heat (blanching) or acid (vinegar/ lemon juice)
- Removing oxygen/ protecting from air

Accelerated by:
- Iron and copper
- Diminution
- Oxygen exposure

Signs of food spoilage

Method	Why is it effective?
Jam Making	Sugar binds with water, so that it is not available for the microorganisms any more
Pickling	Microorganisms do not grow in acidic conditions. That's because low pH and high concentration of salt causes water to be drawn from their cells
Freezing	Low temperatures halt enzymic action, so microorganisms cannot grow or carry out any life functions
Bottling	High temperatures kill microorganisms and inactive enzymes
Vacuum packing	Lack of oxygen means that aerobic microorganisms cannot survive. However, this does not stop anaerobic microorganisms from growing

Keywords:
Cross Contamination
Enzymes
Microorganisms

Carbohydrates

Macromolecules which include mono-, di-, and polysaccharides (built of thousands of monosaccharides) bonded together.

- **Gelatinisation** happens when starch granules absorb water, and swell and break during heating, so that mixtures thicken and form a gel when cooled.
- **Dextrinisation** happens when starch chains break down into shorted chains of dextrins; during this process molecules of water evaporate, and carbon is left to give brown colour; occurs during baking and toasting bread and other baked goods.
  Starch + heat —> dextrinisation
- **Caramelisation** happens when sugar is heated in very high temperatures, causing it to liquidise and form a thick, brown syrup; during the process water evaporates and carbon is left to create a brown colour
  Sugar + heat —> caramelisation

Fats and Oils

Macromolecules built of a glycerol head and fatty acid tail.
Plasticity is the ability
- **Plasticity** the ability of fat to be easily spreadable and melt in various temperatures, dependent on the length of the fatty acids chains in the fat particle
- **Melting point-** temperature at which fat turns into oil