

**EMMANUEL COLLEGE**  
**THE TECHNOLOGY DEPARTMENT**  
 Year 10 GCSE Food Preparation and Nutrition



**Year 10**

GCSE Food Preparation and Nutrition - Unit 1

**Protein**

**The aim of the GCSE Food Preparation and Nutrition course is to teach students all about food in its widest sense and help them to learn and develop a wide range of food preparation skills. It has been designed to help students to understand:**

- What food is composed of. Why we need it and how it affects our long-term health
- How food can be prepared and cooked skilfully
- What happens to the ingredients in food when you prepare and cook them
- Where food comes from and how it is produced and sold
- Which foods different cultures eat throughout the world
- How the food choices people make affect the health and wellbeing of themselves, their families and people who produce food
- How the food choices that people make affect the health and wellbeing of the global environment and its natural resources

**The five main areas of the specification are:**

- Food, Nutrition and Health
- Food Science
- Food Safety
- Food choice
- Food Provenance

**This unit focuses on **Protein foods** and incorporates all of the above topics into the unit, as is detailed below. It will last approximately 12 weeks.**

<b>Source of knowledge</b>	GCSE Illuminate Textbook – GCSE Food Preparation and Nutrition, by Garry Littlewood and Anita Tull Practical lessons – Focused on theory topics being covered Teacher delivery of required knowledge	
<b>Knowledge</b>	<p><b><i>Nutrition</i></b>  <i>Function, sources, deficiencies and excess of protein</i></p> <p>Protein is a macronutrient that is needed by all animals, including humans. Protein molecules are made up of individual ‘building blocks’ called amino acids. There are at least 20 different amino acids that can be found in any number or combination in different proteins.</p> <p>The main functions of protein are:</p> <ul style="list-style-type: none"> <li>• To make the <u>body grow</u> from a baby into an adult and when it has stopped growing, to make certain parts of the body continue to grow (hair etc.)</li> <li>• To repair the body when it is injured or recovering from an illness etc.</li> </ul>	<p>Students will <b>apply</b> the knowledge by;</p> <ul style="list-style-type: none"> <li>• Q&amp;A</li> <li>• Completing worksheets based around the relevant topics</li> <li>• Carrying out practical</li> </ul>

- To give the body energy, although most of the energy that the body requires is gained from carbohydrates

**Deficiency** of protein in the diet:

- Children will not grow properly and may never reach their full height
- Adults and children may lose some of their hair
- Their skin and nails will be in a poor condition
- They will easily develop infections
- They will not be able to digest any food properly

Effects of an **excess** of protein in the diet:

- Protein contains different chemical elements, including nitrogen. Too much nitrogen in the body is dangerous, so it is removed from the body in the urine
- If the diet contains too much protein, the liver and kidneys have to work harder to get rid of the nitrogen. This puts them under stress and could cause them to be harmed.

Low and High Biological Value Proteins

Some of the 20 amino acids cannot be made in the body and have to come ready made from the foods we eat. These are called essential amino acids and there are eight of these needed by adults and children and at least 2 extra ones needed just by children because they are growing.

Protein foods that contain all of the essential amino acids are called **high biological proteins**. This means that they are great for the body, because it does not have to make these amino acids from the foods we eat.

Protein foods that are missing one or more of the essential amino acids are called **low biological value proteins**. If you eat a mixture of LBV proteins together, the essential amino acids that are missing on one will be provided by the other, so you will get all of the amino acids that you need. This is called **protein complementation**.

Protein alternatives

Protein alternatives are manufactured products that are used as alternatives to meat. They have a high protein content and often a low fat content. They have little flavour on their own, but readily take up other flavours. These proteins are often consumed by vegetarians and are used in a wide range of recipes in place of meat or fish.

**Food Science**

Why food is cooked and how heat is transferred to food

Food is cooked for a variety of different reasons; these include:

- To make food safe to eat. High risk foods such as chicken, beef burgers, white fish. Some foods contain natural toxins that would be harmful if the food was eaten raw. 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, for example cakes (melts fat, proteins in egg and flour coagulate, sugars caramelise and starch gelatinises).
- To improve the texture and appearance, this makes it easier to eat, swallow and digest. Cooking causes starch granules to swell, gelatinise and thicken to soften a food for example.

activities to apply the theory knowledge they have gained

- To improve its shelf life. Cooking destroys harmful micro-organisms such as bacteria and moulds, which preserves the food.
- To give people a variety of foods in their diet. Foods cooked in different ways give variety, for example a potato can be roasted, boiled, mashed, turned into a jacket, chips, potato rostis etc.

*The different methods of heat transfer.*

In order to cook food, heat energy has to be transferred to it from a source of heat on the cooker, hob or oven.

Heat energy is transferred in three ways:

- Conduction  
When we heat a metal pan on the hob, or a baking tin in the oven, it quickly heats up and transfers energy to the food inside, via conduction.  
The atoms that make up the metals are tightly packed together in a lattice, when they are heated they begin to vibrate. They then knock into each other and pass on heat energy.
- Convection  
When we heat a pan of cold water on the hob, the heat energy passes through the metal pan by conduction and it is then transferred to the water molecules in the pan.  
As the amount of heat energy going into the water increases, the faster the molecules move and the more they collide with other molecules.  
When they reach the surface of the water, the molecules start to slow down and sink back down again. As they reach the bottom of the pan, they receive more heat energy and start to move up again. This causes convection currents.
- Radiation  
When food is grilled, it is heated by radiation. The heat energy in radiation is in the form of infrared heat rays.  
Infrared rays travel through the air and when they come into contact with a solid object, they are absorbed into the surface of the object and heat it up.

*Selecting appropriate cooking methods*

There are different ways in which foods can be cooked. Choosing a suitable and appropriate method of cooking for specific foods and recipes is part of the skill and fun of cooking. Cooking methods can be categorised under three main headings, moist methods, methods using oil and dry methods.

- water based:

Steaming – Cooking food in the steam rising from a pan of boiling water underneath

Boiling – cooking food in water at 100 degrees

Simmering - Cooking food in a liquid just below boiling point, so it bubbles gently

Poaching- Cooking food in a shallow pan of water or wine at just under boiling point

Braising- sealing meat in hot fat, then cooking it solely in a covered dish with a little liquid

- dry methods:

Baking – cooking foods in a hot oven

Toasting – Cooking starch based foods with a dry heat from a grill or flame

Grilling – cooking foods by intense heat on a metal grid or grill rack

Dry frying

- fat based:

shallow frying – frying foods in a shallow pan with a small amount of oil

stir fry – frying food for a short amount of time, using very little oil

*Food Science topics specific to Proteins:*

Proteins are large molecules, made up of individual units called amino acids. As they are so large, protein molecules are often folded into compact bundles so they take up less space. The chemical bonds in the protein molecule bundle hold it together and stop it unfolding.

Protein denaturation

Protein molecules can easily be denatured. This means the chemical bonds that hold the molecule together can be broken, which makes the protein molecule bundle unfold and change shape.

Denaturation is caused by:

- Heat
- Acids
- Air bubbles
- Mechanical agitation (when whisking egg whites for meringue)

Protein coagulation

Denatured protein molecules are larger and take up more space than they used to, because of this they knock into each other and start to join together in large groups- this is called coagulation. As they coagulate, the protein molecules trap and hold water from the food in pockets between them. as coagulation continues, the appearance and texture of the food changes.

Gluten formation

Consumers expect baked products such as bread and cakes to have a light and open texture. To create the desired texture, a raising agent is added to the uncooked mixture to introduce gas bubbles. Baked mixtures are able to stretch and rise because of gluten. It is a protein that is formed from two separate proteins called glutenin and gliadin, when combined together with a liquid.

When used in bread making, gluten gives the dough plasticity. It also helps to make the gluten elastic.

Foam formation

The light texture of some foods such as mousses and meringue is produced by creating a foam. Foams are formed when gasses are trapped inside a liquid to form a gas in liquid foam. Gas in liquid foams are produced when making recipes such as meringue and whisked sponge.

Egg white is a liquid made of a mixture of protein and water. When it is whisked to make a meringue, the action of the whisk rotating very fast traps lots of air bubbles to make a gas in liquid foam. The action of the whisk also makes some of the compact egg white protein molecules denature, by breaking the bonds that hold them together.

The denatured protein molecules start joining up and bonding with lots of other denatured protein molecules (coagulation). They then surround the air bubbles and make a wall around them, which holds the air bubbles and water in place so the foam is stabilised.

**Food Safety**

*Bacteria, yeasts and moulds are microorganisms*

Micro-organisms are tiny forms of life, both plants and animals. They can be seen only under a microscope. They are sometimes called microbes. Micro-organisms are found in many different places, including food packaging, water, dust and surfaces. They spoil food and make it unfit to eat, because they contaminate it with their waste products. Micro-

organisms that make food unsafe to eat and can cause food poisoning are called pathogens. There are lots of different pathogenic bacteria, yeast and moulds.

#### *High risk foods*

*Enzymes are biological catalysts usually made from protein.*

Enzymes are natural substances that are found in foods and living things. They are called biological catalysts, which means they have the ability to speed up a chemical reaction. Enzymes cause fruit and vegetables that have been harvested to ripen and eventually break down the cells and tissues in them.

Enzymes cause the tissues of meat and fish, and other animals, to break down once the animal has been killed. Enzymes are proteins, so their action can be controlled by causing them to denature.

#### *The growth conditions for microorganisms and enzymes and the control of food spoilage*

All micro-organisms need suitable conditions in which to grow and multiply. Their growth and multiplication can be controlled by changing or preventing the conditions that allow these to happen. The conditions needed are:

- A suitable temperature. The optimum temperature for micro-organisms to grow is around 37 degrees.  
To control – food should be cooked thoroughly and for long enough at a high enough temperature to destroy micro-organisms. Do not leave food out in a warm room for a long period of time.
- A supply of moisture. Micro-organisms need water for their biological processes. If there is not enough moisture, they cannot grow or multiply.  
To control- preserve the food by drying it, food with a high concentration of salt or sugar will remove the water from the micro-organisms cell.
- A supply of food. Micro-organisms need nutrients and energy from food to enable them to grow and multiply.  
To control – prevent them from coming into contact with and contaminating food, by keeping the food covered.
- Enough time. It takes time for micro-organisms to grow and multiply and the more suitable the conditions, the quicker they will do so.  
To control- store, cook and cool foods thoroughly and correctly in order to avoid giving micro-organisms the time to grow and multiply.
- The right pH. If conditions are too acidic or alkaline, it will affect if they can grow and multiply.  
To control- preserve the food in acid to prevent the micro-organisms from growing and multiplying.

#### *Bacterial contamination*

Most pathogenic bacteria cause food poisoning inside the digestive system, particularly in the intestines.

#### *The main types of bacteria which cause food poisoning*

There are many different types of pathogenic bacteria that cause food poisoning. These include:

- Campylobacter  
Often found in raw meat and poultry, milk and dirty water

Symptoms can include diarrhoea, abdominal pain, nausea and fever

Incubation time – 48-60 hours

- E.coli  
Often found in beef and other meat, Raw milk, Untreated water  
Symptoms can include diarrhoea, abdominal pain, vomiting, fever, kidney damage or failure
- Salmonella  
Often found in undercooked poultry, eggs and meat  
Symptoms can include diarrhoea, abdominal pain, vomiting and fever
- Listeria  
Often found in soft cheeses, cheese made from unpasteurised milk, salad vegetables and pate  
Symptoms can include flu like symptoms, can cause miscarriage
- Staphylococcus aureus  
Often found in people, raw milk, cold cooked meats and dairy products  
Symptoms can include diarrhoea, abdominal pain, vomiting and fever

#### *The general symptoms of food poisoning.*

The symptoms of food poisoning can include:

- Bad stomach pain
- Diarrhoea
- Nausea or vomiting
- Headache
- Dizziness
- A raised body temperature, or feeling cold and shivery

Some pathogenic bacteria work their way out of the digestive system and into the bloodstream, where they go around the body and damage vital organs. Food poisoning is particularly dangerous for babies and young children, pregnant women, elderly people and people with a weakened immune system.

#### **Food Choice**

##### *Healthy eating and physical activity level*

What are the factors that affect how people choose what to eat?

- Their knowledge of food, nutrition and healthy eating
- Their desire to eat healthily
- Their nutritional needs at a particular stage of their life (babies and young children, teenagers, adults and elderly people)
- Their state of health (whether they have an allergy, any long term health conditions etc)
- Their physical activity level (PAL)
- Food labels, which give information about nutrition etc
- The media
- Scientific and medical research and discoveries

##### *Religion*

Religious and cultural texts are considered by various religions and cultures to be the core of their tradition. In many religions and cultures, rules including dietary laws instruct as to which foods should and should not be eaten. The main instructions which students need to know are shown below:

- **Buddhism**

The Buddha instructs Buddhists to stop and think about the foods they are eating in five main ways:

What food is, where food comes from, when food should be eaten, how food should be eaten, why we eat food.

Violence towards animals is considered to cause human aggression.

Foods that cannot be eaten: some avoid meat and dairy products, while some only avoid meat.

- **Christianity**

Food and drink is regarded and celebrated as part of God's creation. The freedom to eat and drink in a healthy manner, is regarded as part of the salvation that Jesus brought to men and woman. There are no strict rules that modern Christians are expected to obey.

- **Hinduism**

Food is believed to contain energies that people take in when they eat. Many Hindus are vegetarian, but it is not compulsory not to eat meat. Some Hindu communities practise fasting.

Food that cannot be eaten: Beef, onions and garlic

- **Islam**

Muslim dietary laws are found in the Qur'an. The laws state what is lawful (Halal) and require poultry birds and meat animals have to be slaughtered in a special ritual called Zibah.

Foods that cannot be eaten: Pork and alcohol.

- **Judaism**

Jewish food laws are called 'Kashrut'. Food that is allowed to be eaten is called Kosher, such as fish that have scales and fins, animals that chew the cud and have cloven hooves such as sheep and cows.

Foods that cannot be eaten: Pork and Shellfish. Dairy foods and meat must not be prepared of eaten together.

- **Sikhism**

Many Sikhs are vegetarians. Some Sikhs do not drink alcohol, tea or coffee.

### ***Food Provenance***

*Where and how reared ingredients: meat and poultry*

Many types of animals, including birds and fish, are reared all over the world in large numbers for people to eat. As the world's population increases, there is a demand for more meat to be produced.

There are many large factory farms where hundreds of thousands of animals, fish or birds are intensively farmed.

*Organic and conventional farming / free range production / intensive farming*

Plant foods that are grown intensively on a large scale are likely to be affected by attacks from pests, such as insects etc, they also have to compete for space, light and soil nutrients. In order for a crop not to fail because of pests or weeds, many farmers spray the plants several times as they grow with chemical pesticides. Artificial fertilisers are also used because intensive farming removes lots of the nutrients that need to be replaced quickly in order to grow another crop.

Organic farming is a method of producing crops in which:

- Artificial chemical fertilisers are not allowed to be used
- Farmers develop healthy, fertile soil by adding organic matter and compost

- Farmers rotate their crops so that the soil does not have all of the goodness taken out of it
- Farmers leave a piece of land fallow for a year to break the cycle of pests and allow the soil to become fertile again
- Pesticide use is severely restricted

#### *Sustainable fishing*

*For thousands of years, humans have caught wild fish from the sea and rivers to provide them with protein. Today, fish and seafood provide over three billion people with their main source of protein. It is very important for local communities, but there are pressures on fishing to become more sustainable. Modern fishing boats are large trawlers; they drag large fishing nets through the water to catch fish. Fishing in this way, can cause significant effects on the environment, such as:*

- *Damage to habitats and ecology. When trawlers drag their nets across the seabed, they remove everything and can damage habitats. This severely reduces the food available for any remaining fish.*
- *By catch. Many of the fish that are caught are too young and too small to be eaten and are then discarded. This breaks the natural life cycle of the fish and reduces the number that will go on to be adults and lay eggs.*
- *Overfishing. This means more of a particular species of fish are caught, than sustainable, because they cannot be replaced quickly enough due to the life cycle of the fish.*

*How to make fishing more sustainable:*

- *The number of fish in the sea need to be conserved so their natural life cycle can go on and increase their numbers.*
- *To reduce overfishing, fish quotas have been set for EU countries and fishing boats.*
- *The size of the holes in fishing nets have been increased by law, so that only larger, mature fish can be caught.*
- *Fish need to be caught using methods that do not cause damage to the natural ecosystems and habitats.*

#### *Climate change*

Climate change can cause extreme weather conditions to develop in different parts of the world, which can have negative effects on food production and people's lives. Some of the effects of climate change are:

- Drought
  - Failed plant crops
  - Plant crops cannot be irrigated
  - Dry streams and rivers
  - Dead fish and livestock
  - Dry soil blows away and the land becomes like a desert
  - Forest and bush fires damage farmland and kill livestock
- Flooding
  - Soil and nutrients washed away
  - Soil and farmland polluted by sewage, rubbish, silt and stones left behind from floods
  - Livestock drowned
  - Landslides destroy plant crops, livestock and farmland
- Severe gales and hurricanes
  - Damage to crops and livestock housing
  - Livestock killed
  - Transport affected
- Higher or lower than normal temperatures

- Growing season for plant crops changes
- Plant pollination by insects does not happen at the right time, so plant crops may not produce fruits and seeds
- Livestock may not survive
- Extreme storms, such as dust, snow, thunder and lightning.
  - Plant crops damaged
  - Livestock may die or become ill
  - Water and soil may become polluted

***Food production***

*Primary and secondary stages of processing and production*

Before food reaches our plates, various processes are done to it to prepare for eating. Processing, means making changes to the foods to ensure that they are:

- Safe, appetising and nice to eat
- Able to be transported to shops and ready to be displayed
- Convenient and easy to buy, store and use
- Appealing and attractive to consumers
- Ready for consumers to prepare, cook and serve

There are two main stages to food processing, **primary and secondary processing.**

Primary stages of food processing plant foods:

- Sorting (grading)
- Trimming off leaves, shoots and roots
- Discarding any that are misshapen
- Washing to remove dirt or soil
- Wrapping delicate fruits in tissue paper or other material to protect it
- Adding identification stickers or labels
- Storing fruits and vegetables and a suitable temperature and humidity

How wheat is turned into flour

Stage 1: Harvest

Stage 2: Cleaning and storage

Stage 3: Milling the grain to produce the flour

Primary stages of food processing and production (how animals are processed straight after slaughter)

Animals

- The blood from animals such as pigs, cattle and sheep is allowed to drain away
- The skin and hide are removed
- The carcass is split open lengthways and the internal organs are removed

Poultry

- The blood is allowed to drain away
- The head and feet are usually removed
- The feathers and internal organs are removed
- The carcass is trussed

Fish

- The internal organs are removed
- The fish may be left whole or filleted to remove the bones
- Sometimes, just one part of the fish is used.

	<u>Low and High Biological Value Proteins, Protein complementation, sources, deficiencies and excess, protein alternatives, conduction, convection and radiation, Protein denaturation, Protein coagulation, Gluten formation, Foam formation, glutenin and gliadin, microorganisms and enzymes, food spoilage, micro-organisms, yeast, mould, bacteria, pathogens, enzyme, biological catalyst, campylobacter, E.coli, Salmonella, Listeria, Staphylococcus aureus, healthy living, PAL (Physical Activity Level), Buddhism, Islam, Judaism, Sikhism, Hindusim, Christianity, climate change, drought, flooding, severe gales, extreme storms, sustainable fishing, ecosystem, overfishing, by-catch, habitats, Organic and conventional farming / free range production / intensive farming,</u>
<b>Assessment Focus</b>	Students are required to know the above knowledge and be able to apply this to their exam, which they sit at the end of Year 11 (worth 50% of their final GCSE). Students will be assessed through homework and classwork, along with the practical activities they will undertake. At the end of this unit, they will sit an internal end of unit assessment, aimed at gathering data to determine how much they have understood of the protein topic.

<b>Year 10</b>	
GCSE Food Preparation and Nutrition - Unit 2	
<b>Fats</b>	
<p><b>The aim of the GCSE Food Preparation and Nutrition course is to teach students all about food in its widest sense and help them to learn and develop a wide range of food preparation skills. It has been designed to help students to understand:</b></p> <ul style="list-style-type: none"> <li>• What food is composed of. Why we need it and how it affects our long-term health</li> <li>• How food can be prepared and cooked skilfully</li> <li>• What happens to the ingredients in food when you prepare and cook them</li> <li>• Where food comes from and how it is produced and sold</li> <li>• Which foods different cultures eat throughout the world</li> <li>• How the food choices people make affect the health and wellbeing of themselves, their families and people who produce food</li> <li>• How the food choices that people make affect the health and wellbeing of the global environment and its natural resources</li> </ul> <p><b>The five main areas of the specification are:</b></p> <ul style="list-style-type: none"> <li>• Food, Nutrition and Health</li> <li>• Food Science</li> <li>• Food Safety</li> <li>• Food choice</li> <li>• Food Provenance</li> </ul> <p><b>This unit focuses on <b>Fats</b> and incorporates all of the above topics into the unit, as is detailed below. It will last approximately 12 weeks.</b></p>	
<b>Source of knowledge</b>	GCSE Illuminate Textbook – GCSE Food Preparation and Nutrition, by Garry Littlewood and Anita Tull Practical lessons – Focused on theory topics being covered Teacher delivery of required knowledge
<b>Knowledge</b>	<p><b>Nutrition</b> <i>Function, sources, deficiencies and excess of fat</i> Fat is a macronutrient that is needed by all animals. Fats are solid at room temperature and are called oils when liquid at room temperature. Fats and oils have the same basic chemical structure and provide the same amount of energy. When we eat foods containing fat, our body breaks them up and makes new fatty acids and fat molecules specifically for our bodies to use. Two</p>
	<p>Students will <b>apply</b> the knowledge by;</p> <ul style="list-style-type: none"> <li>• Q&amp;A</li> <li>• Completing worksheets</li> </ul>

fatty acids cannot be made in the body and have to come from the food we eat, these are called essential fatty acids, they can mainly be found in oily fish, plant and seed oils, eggs and fresh meat.

Function:

Fat has four main functions in the body:

- To provide a store of energy in the adipose tissue under the skin
- To insulate the body from the cold and help to keep it warm
- To protect the body from the cold and help to keep it insulated
- To give the body fat soluble vitamins (A,D,E and K).

Main sources of fat in the diet

Fat found in foods is either present as solid fat or liquid oil. Some of these are easy to see. These are **visible fats** and oils. In many foods, however, it is difficult to see the fats and oils they contain because they are combined with other ingredients in the food. These are called **invisible fats** and oils and are often found in cakes and biscuits etc.

**Solid animal fats:**

Visible: butter, lard, suet, ghee, fat on meat

Invisible: cheese, butter in cakes, meat products, meat, many processed ready meals and take-away foods

**Solid plant fats:**

Visible: white vegetable fats, vegetable fat spreads, coconut cream, cocoa butter

Invisible fats: many processed foods that have been fried in hydrogenated vegetable fat, chocolate, pastries, cakes etc that have been made with hydrogenated vegetable fat

**Liquid animal fats:**

Visible: cod liver oil, oily fish

Invisible: milk, cream, oily fish

**Liquid plant fats:**

Visible: nut and seed oils

Invisible: seeds, nuts, fruits, vegetable fat spreads, fried food, many processed foods

***Effects of a deficiency of fat in the diet***

- If carbohydrate is also reduced. Body weight will be lost
- The body will chill quickly
- The body will bruise easily and the bones will hurt if they are knocked
- The body will not receive enough vitamins A,D,E and K

***Effects of an excess of fat in the diet***

- If energy from what is eaten in foods every day is not all used in physical activity, it will be stored by the body under the skin in adipose tissue. Consequently, the body will gain weight and could become obese
- Eating a lot of food that contains high levels of saturated fatty acids has been linked to the development of coronary heart disease

*Saturated fat / unsaturated*

Fats are either saturated or unsaturated. Foods with a lot of saturated fatty acids in them are often called saturated fats. They include butter, lard,

based around the relevant topics

- Carrying out practical activities to apply the theory knowledge they have gained

suet, block vegetable fat, ghee, the fat in meat, palm oil, coconut and chocolate.

Foods with a lot of unsaturated fatty acids in them are called unsaturated fats. They include plant oils such as olive oil, rapeseed, sunflower and corn, oily fish, nuts, seeds and some vegetable spreads.

Solid vegetable fats spreads can be made from liquid vegetable oils.

### ***Food Science topics specific to Fat***

#### ***Shortening***

Short dough mixtures, such as shortcrust pastry and shortbread, have a very tender and crumble texture when they are baked. This is because they have a relatively high fat content, which is mixed in with the flour and prevents the gluten in the flour from forming long molecules. The fat that is used for this is often called a **shortening**.

When shortcrust pastry is made, the first stage involves cutting up the butter or solid vegetable fat and rubbing it into the flour with the fingertips.

The fingertips are used because they are cool, the fat needs to have a plasticity to allow you to rub it in easily. As the fat is rubbed in, the mixture gradually becomes crumbly to look at. When cold water is added to the mixture to bind it together and form the pastry dough, the waterproof layers of fat prevent the formation of long gluten molecules.

#### ***Aeration***

Fats such as butter and vegetable fat spreads are able to trap bubbles when they are beaten together with sugar for a cake mixture. Butter and vegetable fat spreads can do this, because they have a plasticity which means they can be beaten easily. Cooking oils do not trap air as effectively as fats. Mixing fat and sugar together is called creaming, because as the air bubbles are trapped, the mixture becomes lighter in colour and texture. The ability of the fats to aerate the mixture in this way is really important for producing a light, spongy texture in the baked cake.

#### ***Plasticity***

The reason that fat can be spread onto bread for example, is because of a quality called plasticity (its ability to be shaped and spread with light pressure).

The plasticity of fats enables it to carry out processes such as spreading raw cake mixture into a cake tin, piping buttercream onto cakes, spreading cream cheese onto crackers etc.

This feature is due to their chemical structure, all fats are a mixture of triglycerides, containing different fatty acids. The triglycerides all have different melting temperatures. This is why fat will soften and melt over a range of temperatures.

#### ***Emulsification***

Food products such as mayonnaise, milk, butter and hollandaise sauce are emulsions of either oil in water, or water in oil emulsions.

- If you put some oil and water into a jar and shake it, the oil and water will mix together and form a cloudy looking liquid. They will then separate- as oil and water do not mix together permanently.

- Oil and water can be made to mix together, by adding an emulsifier. The emulsifier that is used in recipes, such as mayonnaise, is called lecithin which is found in egg yolks.
- Emulsifiers are molecules with two ends, one is hydrophilic and one is hydrophobic. When they are added to the mixture, they arrange themselves so they prevent the oil and the water from separating. The mixture is then called an emulsion.

#### *Making informed choices for a balanced diet*

Health experts and the government have worked together and produced a set of dietary guidelines and an Eatwell plate to help people make informed choices when they are deciding what to eat. The brief guidelines are:

- Base your meals on starchy foods
- Eat lots of fruit and vegetables
- Eat more fish – including a portion of oily fish each week
- Cut down on saturated fat and sugar
- Eat less salt
- Get active and be a healthy weight
- Drink plenty of water
- Don't skip breakfast

#### *The current guidelines for a healthy diet / healthy body weight*

- **Potatoes, bread, rice, pasta and other starchy carbohydrates**  
About 1/3 of all of the food we eat should be from this group  
If possible, choose wholegrain or higher fibre versions with less added fat  
Include at least one starchy food in each main meal
- **Fruit and vegetables**  
About 1/3 of all the food we eat should be from this group  
Eat at least 5 portions of a variety of fruit and vegetables each day  
3 heaped tablespoons of vegetables  
A dessert sized bowl of salad  
A glass (150ml) of fruit juice  
Does not include potatoes
- **Dairy and alternatives**  
Eat 2-3 foods a day from this group  
Choose lower fat and lower sugar options  
Alternatives include milk and related products  
Try to choose unsweetened alternative milks that have been fortified with calcium
- **Beans, pulses, fish, eggs, meat and other proteins**  
Eat more beans and pulses (peas and lentils)  
Vegetables protein foods include tofu, tempeh, TVP and mycoprotein  
Eat 2 portions of sustainably sourced fish per week  
Eat less red and processed meat products
- **Oils and spreads**  
Eat only small amounts of foods in this group  
Choose unsaturated oils and unsaturated vegetable fats

#### *Nutritional needs at different life stages*

##### **Pre-school children**

Body growth and development are rapid

A lot of energy is used in activity

Particularly important are: Protein, carbohydrates, fat, minerals, vitamins, fibre and water

### **Teenagers**

The body grows rapidly at certain times and develops from a child, into an adult

Particularly important are: protein, vitamins A, B C, D and E, Carbohydrates, Fats and minerals

### **Adults**

The body does not grow anymore, the body needs to be maintained to keep it free from disease, strong and active

Weight gain can occur if the energy intake of the diet is unbalanced and insufficient physical activity is taken

Particularly important are: Protein, vitamins A, B C, D and E, Carbohydrates, fats and minerals

### **Elderly adults**

Body systems such as digestion and blood circulation start to slow down

Blood pressure may increase

The body needs to be maintained to keep it free from disease, strong and active

The metabolic rate gradually slows down

The appetite usually gets smaller

The sense of smell and taste may be lost

The skeleton naturally starts to lose minerals and the bones can become fragile

Joints and muscles become stiff and weaker

Eyesight may weaken

Particularly important are: Protein, carbohydrates, fats, minerals, calcium and vitamin D, Iron and Vitamin C, Vitamins A,C E, B group (especially vitamin B12)

### **Food Safety**

#### *Microorganisms in food production*

There are many types of micro-organisms that are non-pathogenic and do not cause food poisoning, they are in fact used as part of food production.

Micro-organisms used in the production of cheese

When cheese is made, two types of micro-organisms are used (bacteria and mould). The below information shows how cheddar cheese is made:

- The milk is pasteurised
- A special bacteria culture is added to the milk
- An enzyme called rennet is added
- The curds are cut
- The whey (liquid) is drained off
- The curd is dried
- The curd is milled
- The cheese is pressed
- The cheese is ripened/ matured

### **Food Provenance**

*How processing affects the sensory and nutritional properties of ingredients.*

*Milk:*

**Pasteurisation** does not significantly affect the flavour or colour of the milk and has little effect on the nutrients in the milk

**UHT** method has a minimal effect on the flavour of the milk or its nutrients. However, after about 6 months in storage, up to 60% of the vitamin B12 in the milk may be lost.

**Sterilisation:** Sterilisation causes the milk to darken in colour and change flavour due to its effects of the heat on the natural sugar and proteins in the milk. Some of the proteins in the milk are denatured and 35% of B1 and 90% of B12 are lost.

**Micro-filtered milk:** The flavour and nutritional content of micro-filtered milk are not significantly affected.

*Fortification*

Foods can also be fortified with nutrients. This means adding extra nutrients to a food, either to increase the amounts of nutrients naturally present in food or add other nutrients into the food that are not naturally present.

Some foods (i.e. vegetable fat spreads) are fortified by law  
 Some foods are fortified voluntarily by food manufacturers  
 Fortification of food is strictly controlled by law

Food manufacturers are not allowed to say or suggest that their nutritionally modified food products can prevent, treat or cure a disease, but they can say that the products can provide a health benefit, such as maintaining healthy bones

*Additives*

Food additives are natural or synthetic chemical substances that are added to foods, during manufacturing or processing to improve their quality, flavour, colour, texture or stability. Most processed foods have additives put into them.

Additives are used for a variety of different reasons:

- Preservatives: increase the shelf life of a food
- Flavourings, sweeteners and colouring: improve the sensory qualities of foods
- Emulsifiers/stabilisers: Improve the structure and texture of food

If people eat mainly processed foods, it is likely that they will be consuming a wide range of additives.

- There is concern about the use of additives, as some have been shown to cause side effects such as poor behaviour, headaches and other health problems
- The use of food additives is regulated and controlled by law
- The EU requires food manufacturers to clearly label additives in the list of ingredients on a food label as an E number
- E numbers are given to food additives that have passed various safety tests and have been approved for use in food.

**Vocabulary** *Insulation, liquid, glycerol, fatty acids, oil, store of energy, insulation, protection, fat soluble, visible fats, invisible fats, saturated fats, unsaturated fats, shortening, aeration, plasticity, emulsification, additives, E number, preservatives, emulsifiers, flavouring, micro-filtered milk, UHT milk, micro-organism used in food production*

**Assessment Focus**

# Year 10

## GCSE Food Preparation and Nutrition - Unit 3

### Carbohydrates

The aim of the GCSE Food Preparation and Nutrition course is to teach students all about food in its widest sense and help them to learn and develop a wide range of food preparation skills. It has been designed to help students to understand:

- What food is composed of. Why we need it and how it affects our long-term health
- How food can be prepared and cooked skilfully
- What happens to the ingredients in food when you prepare and cook them
- Where food comes from and how it is produced and sold
- Which foods different cultures eat throughout the world
- How the food choices people make affect the health and wellbeing of themselves, their families and people who produce food
- How the food choices that people make affect the health and wellbeing of the global environment and its natural resources

The five main areas of the specification are:

- Food, Nutrition and Health
- Food Science
- Food Safety
- Food choice
- Food Provenance

This unit focuses on **Carbohydrate foods** and incorporates all of the above topics into the unit, as is detailed below. It will last approximately 12 weeks.

<b>Source of knowledge</b>	GCSE Illuminate Textbook – GCSE Food Preparation and Nutrition, by Garry Littlewood and Anita Tull Practical lessons – Focused on theory topics being covered Teacher delivery of required knowledge
<b>Knowledge</b>	<p><b>Nutrition</b> <i>Function, sources, deficiencies and excess carbohydrate</i> Carbohydrate is a macronutrient by all animals. It is made by green plants during a process called photosynthesis. Carbohydrates have two main functions in the body:</p> <ul style="list-style-type: none"><li>• To give the body energy, carbohydrates are the main source of energy in our diet.</li><li>• To help the body get rid of waste products, dietary fibre is a type of carbohydrate that helps us to produce soft, bulky solid waste which are easily passed out of our body.</li></ul> <p>There are two main sources of carbohydrates, sugar and complex carbohydrates.</p> <p><b>Starch (polysaccharides)</b> Complex carbohydrates do not taste sweet. Plants produce several types of complex carbohydrates during photosynthesis. They are called polysaccharides. Polysaccharides include starch, pectin, dextrin and dietary fibre (also called Non-starch polysaccharide).</p> <p><b>Sugars (monosaccharides/ disaccharides)</b> Sugars are a group of carbohydrates that taste sweet. Plants produce two different types of sugar during photosynthesis. Monosaccharides, which are made of one sugar molecule. There are three monosaccharides: <u>glucose, galactose and fructose.</u></p> <p>Students will <b>apply</b> the knowledge by;</p> <ul style="list-style-type: none"><li>• Q&amp;A</li><li>• Completing worksheets based around the relevant topics</li><li>• Carrying out practical activities to apply the theory knowledge they have gained</li></ul>

Disaccharides, which are made of two sugar molecules joined together. There are three types of disaccharides: sucrose, lactose and maltose.

**Effects of a deficiency of carbohydrate in the diet:**

- Lack of energy/tiredness
- Weight loss
- Severe weakness

**Effects of an excess of carbohydrate in the diet**

- If the diet contains more carbohydrate than the body needs and uses, it will be converted into fat and stored in the body. This could lead to obesity if the surplus stored energy is not used up in physical energy.
- Refined and processed carbohydrate foods are quickly broken down and absorbed in the body. This causes a rapid rise in the level of sugar in the blood. If the diet contains lots of these types of food and drinks and they are eaten frequently, this will put stress on the pancreas. Insulin allows glucose to enter the body so that the cells can use it to produce energy. Eventually, the pancreas may stop working properly or the cells will become resistant to the insulin and the person may develop type 2 diabetes.
- Eating certain types of sugars frequently throughout day can lead to tooth decay. Sugars that are found naturally, are less likely to cause tooth decay.

**Food Science relating to carbohydrates:**

*Gelatinisation*

- *When starch is heated in a liquid, it gelatinises. Starch molecules are made of thousands of glucose molecules joined together, either in long straight chains or short chains with branches. When starch granules are put into cold water, they sink to the bottom of the pan. When they are then heated, they start to absorb the water and swell up. In sauce making, this makes the starch start to thicken.*

*Dextrinisation*

- *When foods containing starch, such as bread, cakes and scones are cooked by dry heat (grilling, baking and toasting), they develop a brown colour on the outside.*
- *This is partly due to the effect of the heat on the starch molecules which break into smaller groups of glucose molecules called dextrin.*
- *The formation of dextrin contributes to the flavour of the crust/toast.*

*Caramelisation*

- *Sugar that is used in cooked (sucrose) is a disaccharide made from glucose and fructose. When sugar is heated, it firstly melts, then forms a syrup and boils. As this happens, the molecules of sucrose start to break up. As the heating continues, the hydrogen and oxygen atoms in the sugar form water, which evaporates and the colour of the sugar gradually changes.*

**Food Safety**

*Mould growth*

Moulds are a type of micro-organism. They are related to the mushroom and there are many types. Some moulds can contaminate food by growing and multiplying in it and producing waste products. In order to prevent moulds from multiplying in food, it is important to understand how they grow and multiply. Moulds are small, but when they grow on foods, it is possible to see them because they grow and multiply. Like all micro-organisms, moulds need suitable conditions, such as temperature, moisture, food, time and pH.

#### *Yeast action*

There are many species of wild yeasts and they can spoil foods, especially those that contain sugar, such as fresh and dried fruits.

Like moulds, they will settle on the food and start to grow and then ferment the sugar to produce Carbon dioxide gas and alcohol. Yeast spoilage appears as pale brown, spotted growth on the skin of the fruit, which becomes brown and mushy as the yeast continues to grow.

#### **Food Choice**

##### *Healthy eating and physical activity level*

Factors/sources of information that help people choose which food to eat:

- Their knowledge of food, nutrition, healthy eating and cooking from being educated about these
- Their desire to eat healthily themselves
- Their nutritional needs at a particular stage of life
- Their state of health
- Their physical activity level
- Food labels
- The media
- Scientific and medical research

##### *Food intolerance and allergies*

Some people have medical conditions that affect which foods they can and cannot choose to eat, for example someone who has a high blood pressure may need to limit the amount of foods they eat that contain salt. There are two main medical conditions that are directly related to food choice; food intolerance and food allergy.

Food intolerance is sometimes called food sensitivity. It is a condition where, for some reason, a person becomes sensitive to particular foods and develops a range of symptoms, including:

- Constant tiredness and weakness
- Muscle and joint aches
- Nausea
- Pain and bloating
- Diarrhoea
- Eczema and dry skin conditions

Two particular forms are:

Lactose intolerance and coeliac disease

Lactose intolerance:

Lactose is a natural disaccharide that is found in milk and milk products. Most people can digest it without any problems. People who are lactose intolerant cannot digest it and bacteria that live in the large intestine break it down, which causes a large amount of gas to be produced. This can make a person feel very unwell.

	<p>The only way to avoid symptoms happening, is to avoid eating or drinking any food that contains milk or milk products.</p> <p>Coeliac disease Coeliac disease is an intolerance to the protein gluten. Gluten is found in wheat, barley, oats and rye and food products that contain them. In coeliac disease, gluten damages the villi so that become very short. In damaged, short villi cannot absorb many nutrients and so the person with coeliac disease becomes malnourished.</p> <p><b>Food Provenance</b> <i>Where and how grown ingredients: cereals</i> Plant crops are an essential part of our food supply. They are usually grown by a method called intensive farming, where a large number of the same crop are grown together. A large number and variety of plant crops, particularly salad vegetables, tomatoes and herbs, are grown inside large glass houses or plastic poly tunnels. These poly tunnels are long, curved plastic structures that protect them from the effects of the weather. They provide sheltered conditions and are large enough for people and machines to work inside. Some plant crops are grown in special troughs containing water, which has nutrients added to it. This is called <b>hydroponic production</b>. <i>Food security /Insufficient land for growing food</i></p> <p><i>GM food</i> Genetic modification of food plants and animals was developed to enable farmers to breed new types of animals and plants that have:</p> <ul style="list-style-type: none"> <li>• Better resistance to pests and disease</li> <li>• Faster or stronger growth rates</li> <li>• A different nutrient profile</li> <li>• A more intense flavour or colour</li> </ul> <p>Most GM crops that have been developed are plants. In all plants and animals, genes, which are found in cells, control them and make them have certain unique characteristics such as colour, shape, flavour and size. Some people object to GM technology, because they have concerns about:</p> <ul style="list-style-type: none"> <li>• The effects of GM crops on the natural ecology</li> <li>• Interfering with the natural process of plant and animal reproduction</li> <li>• The possibility of some people being allergic to specific GM foods because a particular characteristic has been put in them</li> <li>• The effects on farmers, especially in developing countries, who cannot save the seed from many GM crops to grow next year</li> <li>• That it is not possible to tell by looking whether a food has been genetically modified or not.</li> </ul>	
<b>Vocabulary</b>	<i>Energy, waste products, fibre, sugar and complex carbohydrates, Starch (polysaccharides), Sugars (monosaccharides/ disaccharides), glucose, galactose and fructose, Gelatinisation, Dextrinisation, Caramelisation, Mould growth, Yeast action, Healthy eating and physical activity level, Food intolerance and allergies, hydroponic production, poly tunnels, Genetic modification</i>	
<b>Assessment Focus</b>	Students are required to know the above knowledge and be able to apply this to their exam, which they sit at the end of Year 11 (worth 50% of their final GCSE). Students will be assessed through homework and classwork, along with the practical activities they will undertake. At the end of this unit, they will sit an internal end of unit assessment, aimed at gathering data to determine how much they have understood of the carbohydrate topic.	

