

AQA Additional Applied Science - 11.2 Food Science

The Food Standards Agency is the independent food safety watchdog set up by an Act of Parliament in 2000 to protect the public's health and consumer interests in relation to food. Food scientists and dietitians work within the Agency to promote good eating habits and to ensure that our food is safe and that it is labelled correctly.

In this section You will learn about some of the science and techniques used by food scientists and dietitians to help us maintain a healthy body and a healthy lifestyle.

The role of a dietitian is to study individuals' diets, record individuals' food consumption and nutritionally analyse their intake. They then make recommendations on how individuals can eat a healthier diet. A healthy diet contains lots of fruit and vegetables. It is based on starchy foods such as wholegrain bread, pasta and rice and is low in fat (especially saturated fat), salt and sugar.

Food nutrients and their functions

You need to know:

- that the human body requires a variety of nutrients in order to carry out the vital functions of life: respiration, movement, growth and repair of body tissue
- the function of the following nutrients:
 - Carbohydrates: energy providers
 - Saturated and unsaturated fats: insulation, energy provision, a viable source of the fat-soluble vitamins (A, D, E and K), protection of vital organs (e.g. kidneys)
 - Proteins: repair of body tissues, growth and energy
- the function of the following vitamins:
 - A: healthy eyesight, keeps mucous membranes free from infection
 - B: release of energy from carbohydrate foods, nerve functions
 - D: healthy teeth and bones, absorption of calcium and phosphorus
 - K: aids the clotting of blood
 - C: maintenance of the immune system, absorption of iron, maintenance of skin and linings of the digestive system
- the function of the following minerals:
 - iron: helps the body to manufacture haemoglobin, which is responsible for transporting oxygen around the body
 - calcium: for healthy teeth and bones
 - phosphorus: aids release of energy from food
 - zinc: for enzyme action and wound healing
- the symptoms of any deficiencies of vitamins within the human body:
 - A: inability to adjust to dim light, dry skin and mucous membrane
 - B: anaemia, mouth sores, nerve cell degeneration
 - C: bleeding gums, poor healing of cuts and wounds, weakening of blood vessels
 - D: weak teeth and bones, which may deform through excess body weight
- examples of foods that are good sources of these nutrients
- the health risks of eating too much saturated fat, sugar and salt (heart disease, diabetes and high blood pressure in later life)
- the importance of fibre in the diet
- the importance of controlling the overall energy intake (energy requirements of different individuals, dieting).

You should be able to use data, theories and explanations to:

- Comment on the nutritional value of food
- Consider the impact of marketing, fast food and lifestyle on diet and health.

Food additives

There are three reasons for the use of food additives: to improve taste, to improve appearance and to increase shelf life. The nature and quantity of food additives is strictly regulated and all additives have been given an 'E' number.

You need to know and understand:

- the function of and examples of the following additives:
 - Antioxidants (vitamin C)
 - Flavouring and flavour enhancers (monosodium glutamate)
 - Colourings (tartrazine)
 - Preservatives (benzoic acid)
 - Sweeteners (aspartame)
 - Thickeners (starch)
- some advantages of using additives (improved taste, appearance and shelf life)
- some disadvantages of using additives (toxic nature of some preservatives, hyperactivity linked to tartrazine).

Food labelling and food testing

Foods are often composed of more than one nutrient. Food analysts test the composition of individual foods and combinations of foods in order to ensure that accurate nutritional information is given on food labels.

You need to be able to:

- interpret food labels, including 'sell by' dates, quantities and energy values of nutrients and other components of food including food additives
- *carry out qualitative food tests for starch, fat, protein, reducing sugar and acidity*
- *carry out quantitative tests on food and food supplements:*
 - *Moisture content by evaporation*
 - *Suspended matter by filtration*
 - *Acidity of a product by titration*
 - *Vitamin C content of food*
 - *iron content of food supplements.*

You should be able to use data, theories and explanations to:

- evaluate qualitative and quantitative analysis of food
- consider the social and economic impact of information about the long-term harmful effects of eating certain types of food or food containing certain types of additive.

Useful microorganisms in the production of food

Microorganisms such as bacteria, yeast and other fungi play an important part in the production of some foods and drinks.

Microbiologists study these living organisms to see what factors favour their growth and how their growth can be controlled to produce useful products e.g. bread, yoghurt, beer, wine and cheese.

You need to be able to:

- describe the use of bacteria, yeast and other fungi in food production (bread, wine, beer, yoghurt and cheese).

Microorganisms and food safety

Food poisoning is caused by the growth of microorganisms, usually bacteria, and by the toxins they produce when they grow. Hygiene and quality control staff in industry and Public Health Inspectors are responsible for controlling the growth of bacteria in places where the presence of bacteria causes harmful effects.

You need to know:

- examples of bacteria that cause food poisoning (campylobacter, E. coli, salmonella)
- optimum conditions for the growth of bacteria (warmth, moisture, food source)
- the common symptoms of food poisoning (stomach pains, vomiting, diarrhoea)
- how food preparation areas are kept free of bacteria (personal hygiene, disinfectants, detergents, sterilisation, disposal of waste, control of pests e.g. insects, mice)
- some examples of the ways in which the growth of bacteria is slowed down or stopped (refrigeration, freezing, heating, drying, salting, pickling).

You should, be able to:

- consider the problems of contamination of food products which have led to product recalls or health scares.
- *carry out tests on food products to determine the level of bacteria in the food*
- *use aseptic techniques to swab areas to detect the presence of bacteria*
- *complete serial dilutions to do an accurate bacterial count*
- *make streak plates to identify the types of bacteria present.*

Organic and intensive farming

Two contrasting approaches to food production are organic and intensive farming. Intensive farming produces large quantities of food cheaply and efficiently by maximising the growth of crops and farm animals. Some consumers are willing to pay more for a product that has been produced in a more environmentally friendly way.

You need to:

- understand that as crops grow they remove essential nutrients from the soil and that these nutrients need to be replaced know that plants need the minerals nitrates, phosphates, potassium and magnesium, which they obtain from soil, for healthy growth
- describe how intensive farming increases crop yields by using artificial fertilisers, pesticides, herbicides and fungicides
- describe how intensive farming increases meat production by using controlled environments (eg hens, pigs)
- describe how organic farming uses the alternative methods of natural fertilisers, natural pesticides and mechanical methods of eliminating weeds in crop production
- describe how organic farming keeps animals under more natural conditions.

You should be able to assess the applications and implications of science when:

- comparing the advantages and disadvantages of both types of farming (food quality, cost, animal welfare, effect on environment).

You need to be able to:

- *plan and assess how well a plant has grown under various conditions.*