



C4: Food Matters

Here is a checklist of knowledge and understanding needed for Food Matters. You will be expected to apply your knowledge and understanding to familiar and unfamiliar situations.

C4.1 Are we what we eat? What happens in our bodies to the various chemicals in the food we eat?

I should be able to:

- recognise that we eat food because it contains the chemicals that we need to stay alive;
- appreciate that these chemicals are the same wherever they come from and however they are made;
- recall that food may contain chemicals that are not needed by our bodies;
- recognise that diet can affect the health and behaviour of individuals;
- recognise that the chemical reactions that must happen for living things to stay alive take place inside cells;
- appreciate that we obtain food from plants and other animals;
- describe the processes by which food substances are broken down into smaller, soluble substances so that they can be absorbed and transported in the blood (limited to):
 - starch to form glucose,
 - proteins to form amino acids,
 - fats to form fatty acids and glycerol;
- describe how glucose reacts with oxygen in cells to provide energy, a process called respiration;
- appreciate that cells use some of this energy to build up amino acids into the much larger molecules of many different proteins;
- recognise that these protein molecules become part of our bodies;
- recall that if harmful chemicals are absorbed into our bloodstream they can often be changed by our liver cells into harmless chemicals and/or removed from the blood stream by the kidneys and excreted in urine;
- recognise that chemicals that are not dealt with in either of these ways may accumulate in our bodies and so reach toxic levels;
- appreciate that chemical processes in body cells also generate harmful chemicals which are removed in the blood stream and finally broken down (in the liver) and/or excreted (limited to carbon dioxide through the lungs and urea through the kidneys).

**C4.2 What steps are taken to protect us from harmful food additives?
Why do food products contain additives, and are they safe to eat?**

I should be able to:

- appreciate that some chemicals are deliberately added to our food, e.g. as preservatives or to enhance flavour.

When provided with information about the steps that are taken to protect us from harmful chemicals in our food, I should be able to:

- identify, and distinguish, issues of technical feasibility (what can be done) from values (what ought to be done);
- list the main benefits and drawbacks of the use of particular classes of additives, and the groups who benefit or suffer;
- discuss the main costs of a course of action, and who will pay for them;
- explain why different courses of action may be taken in different social and economic contexts; appreciate the need for, and assess the adequacy of, the regulations governing food safety.

C4.3 Do food producers really need to use so many chemicals or is organic food better? How do fertilizers and other agricultural chemicals affect crop yields?

I should be able to:

- recognise that many people in the world are short of food;
- describe how scientific knowledge about plant breeding and growth can be used to alleviate some of these shortages;
- recognise that the increase in population in the 19th and 20th centuries has meant that land has to be used more intensively than before;
- appreciate that atoms of the element nitrogen are found in the protein molecules that are important in all living cells;
- recognise that the nitrogen cycle involves the continual cycling of compounds containing nitrogen;
- appreciate that use of the same land each year to grow crops means that chemicals containing nitrogen, potassium and phosphorus are lost from the soil, and that unless these are replaced, the land will gradually produce less and less food;
- describe the main stages in the nitrogen cycle;
- describe how synthetic fertilizer is used in intensive farming to improve crop yield but can harm soil structure and lead to pollution of water sources;
- compare this to the use of natural fertilizers in organic farming which may not increase yields as much, but produce fewer problems;
- recognise that decisions on use of fertilizers depend on factors such as costs and benefits to the community, yield of crop required and intensity of cultivation;
- appreciate that yields from crops may be reduced by animals, weeds, fungal attack or disease;
- compare the methods used in organic or intensive chemical agriculture to protect crops against insects, weeds, fungi or disease.

When provided with information relating to the relative benefits and costs (to producers and consumers, rich and poor, and to the environment) of using synthetic fertilizers, herbicides and pesticides, and 'organic' crop production,

I should be able to:

- give examples of the beneficial impacts of science and technology, of some of its undesirable side-effects, and suggest how these might be tackled;
- discuss the role of scientists in identifying effects of human activity or human population on the environment;
- explain the idea of sustainable development, and apply it to specific situations;
- identify, and distinguish, issues of technical feasibility (what can be done) from values (what ought to be done);
- list the main benefits of a course of action, and the groups who benefit;
- explain why different courses of action may be taken in different social and economic contexts;
- discuss the main costs of a course of action, and who will pay them.

C4.4 Is there a need for genetically modified (GM) foods and should we be concerned about them? What are GM foods and how safe are they?

I should be able to:

- appreciate that over many years, plants we use for food have been produced by using selected plants for breeding to improve yield and resistance to disease, so favouring particular combinations of genes;
- describe key features of genetic modification of species:
- because all organisms use the same genetic code to carry units of information, a gene can be taken from the nucleus of one cell and placed into a different cell;
- the gene may be from a different organism;
- this process produces cells with a new combination of genes, and the resulting organism will display new characteristics which may be useful to humans;
- scientists can now add genes to, or remove genes from, the plants that are grown as crops;
- the plants, and the food we obtain from them, are then said to be genetically modified (GM);
- recognise and compare potential advantages and disadvantages of genetic modification of crop plants:
 - a plant can be made resistant to a particular herbicide, so that a field in which the plants are growing can be sprayed with herbicide to kill weeds,
 - a plant can be made to produce its own insecticide so that insect pests that feed on the plant are killed,
 - a plant can be modified so that its fruit is more resistant to rot,
 - a plant can be made to produce useful drugs, vaccines or nutritional supplements such as vitamins, so that eating the food will deliver the drug or supplement,
 - the genetic modifications could be transferred to related plants, including wild plants, by pollination,
 - the different chemicals in the modified plants could be harmful to humans and other animals such as pollinating insects;

When provided with further information about particular examples of the genetic modification of plants used for food production and about the use of field trials to investigate them,

I should be able to:

- give examples of the beneficial effects of science and technology and of some of its undesirable side effects, and how these might be tackled;
- identify, and distinguish, issues of technical feasibility (what can be done) from values (what ought to be done);
- -list the main benefits and drawbacks of a course of action, and the groups who benefit or suffer;
- discuss the main costs of a course of action, and who will pay them;
- explain why different courses of action may be taken in different social and economic contexts.