

Chapter 1 Section A (short-answer questions)

1. Explain what the following terms mean:

a) Micro-organisms (1 mark)	<i>Micro-organisms are tiny, often microscopic forms of plant and animal life and there are three groups: bacteria, moulds and yeasts.</i>
b) Optimum conditions (1 mark)	<i>Optimum conditions are the most favourable conditions for micro-organisms to grow and reproduce, where they have a supply of food and water, the right temperature and pH (acidity/alkalinity), and either oxygen or no oxygen.</i>
c) Danger zone (1 mark)	<i>The danger zone is the temperature range of 5°C to 63°C, which is the optimum range of temperatures for bacteria and other microbes to rapidly grow and multiply.</i>

2. Explain, with examples, the definitions of high-risk and low-risk foods. (4 marks)

	<i>The word 'risk' refers to the likelihood that pathogenic bacteria will grow and multiply in a particular food and cause food poisoning.</i>
	<i><b>High-risk foods</b> are those that favour the growth and multiplication of bacteria and include meat, poultry, fish, seafood, eggs, milk, cream and some cheeses.</i>
	<i><b>Low-risk foods</b> provide less favourable conditions for microbial growth and multiplication, e.g. those with a low moisture content, e.g. biscuits, crackers, cereals, and those with a high concentration of salt, sugar or acid, e.g. salted fish, jams and syrups, and pickles and chutneys.</i>

3. Describe the function of:

a) A bacterial spore (1 mark)	<i>A bacterial spore is a protective outer coating, which bacteria cells grow if the conditions are not right for them to multiply. Each bacterium remains inactive inside its spore until the right conditions return, then they germinate and become active again, often producing very dangerous toxins as they do so.</i>
b) A mould spore (1 mark)	<i>Moulds produce groups of stalks on the surface of food, and at the top of each stalk there is a sporangium containing spores. When it is ripe, each sporangium bursts and releases spores into the air. The spores travel through the air and land on the surface of another food and if the conditions are optimum, they germinate, and new mould plants start to grow to continue the life cycle of the mould.</i>

4. Give two examples of physical spoilage. (2 marks)

	<i>If a food is spoiled, it means it has become unpalatable, unfit and unsafe to eat. Physical spoilage of food, such as an apple, can be caused by it being dropped or crushed, which causes bruising. The damage causes the apple's cells to be broken open and enzymes and natural substances in them to mix with oxygen from the air. The natural substances then change to an unpalatable brown colour. Frozen foods such as chicken, can be physically spoiled by freezer burn if they are not wrapped properly to protect them from the frost. Water molecules inside the chicken move out of the food towards the cold walls of the freezer which makes the food dry out and develop an unpalatable texture, flavour and appearance known as freezer 'burn'.</i>
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## Section B (extended-answer questions)

1. Explain, with details and examples, the ways in which enzymes act on foods after harvest/ slaughter. (8 marks)

The answer should include:

- The definition of an enzyme. (2 marks)
- The process of ripening and what happens in different foods, e.g. fruits, vegetables, cheeses, fresh meat (aging). (3 marks)
- Definition of decomposition; how it happens and the effects on foods and food safety, with examples. (3 marks)

*Enzymes are natural catalysts, i.e. chemical substances (proteins) that speed up chemical reactions. When a plant food is harvested or an animal is slaughtered for food, the processes of ripening and decomposition begin, due to the action of enzymes naturally present inside the plant or animal and enzymes that come from micro-organisms, mainly bacteria.*

*Ripening changes the colour, flavour and texture of foods such as fruits and vegetables. For example, tomatoes gradually change colour from green to red (or yellow/orange depending on the variety) as they ripen, due to enzymes. Other enzymes in the tomatoes soften their texture and develop the familiar flavour and aroma of tomatoes, which will have gradually become sweeter (as the starch they contain is broken down into smaller sugar molecules), tastier and juicier.*

*Cheeses also ripen due to the action of enzymes on the curd from the bacteria and moulds that have been added and those that are found naturally in the milk, causing flavour, texture and colour to develop. This can take a few days, weeks or months, depending on the type of cheese being made.*

*Fresh meat is left to age (ripen) after slaughter for a few days or up to a month, by being hung in a cold store. This allows enzymes in the muscle cells to break down large molecules into smaller molecules that have flavour, e.g. proteins are broken down into individual and groups of amino acids that contribute flavour; fats are broken down into fatty acids that contribute aroma. Muscle fibres are held together in bundles by connective tissue, which consists of the proteins collagen and elastin. The enzyme activity tenderises the meat by weakening the collagen, and allows it to convert more easily to gelatine during cooking, which releases the muscle fibres and makes the meat tender. It also reduces the amount of moisture lost from the meat during cooking, which makes it juicier (succulent) to eat.*

*Ripening occurs before decomposition, which is the breakdown (by enzymes) of large, complex molecules (e.g. proteins) inside plants and animals into smaller molecules that are then absorbed and used by bacteria and other microbes. This causes the food to become unpalatable and unfit to eat.*

*In fruits and vegetables, enzymes are involved in their decomposition by causing their texture to soften and cell walls to break down. As this happens, enzymes and natural substances in them mix with oxygen from the air. The natural substances then change to an unpalatable brown colour. Bacteria, moulds and yeasts then contaminate them and cause further decomposition by producing their own enzymes. A similar thing happens in meat, poultry and fish and the enzymes lead to chemical changes that cause the production of unpleasant odours.*

2. Describe and explain how moulds and fungi spoil foods and make them harmful to eat. (10 marks).

The answer should include:

- General definition of moulds, with examples, and how they obtain energy and nutrients through decomposition. (2 marks)
- Optimum conditions for growth and reproduction. (3 marks)
- Structure of moulds and their life cycle to help explain how they spoil foods. (3 marks)
- How yeasts spoil foods and can make it unsafe to eat. Should include fermentation process. (2 marks)

NB The use of diagrams would be appropriate in this answer.

*Moulds belong to a group of plants known as fungi, which includes mushrooms and yeasts. There are many types of moulds, but they all have a similar life cycle and features. Moulds get their energy and nutrients from the food on which they land by decomposing (decaying) it. They do this by releasing enzymes, which break down large molecules in the food and release nutrients and energy, which the moulds then absorb and use.*

*Like all micro-organisms, moulds need optimum conditions in which to grow and multiply, i.e.:*

- a suitable temperature: 20°C to 30°C is optimum, but they can grow in cooler temperatures such as in refrigerators
- a suitable pH
- a supply of moisture: moulds grow particularly well in humid conditions where there is a high level of water vapour in the air and on moist foods, but there are some that can grow on dry foods
- a supply of energy and nutrients
- the right level of oxygen, although some species of moulds are anaerobic and grow without oxygen
- enough time.

Moulds consist of the following parts:

1. Hyphae ('roots'), which penetrate the surface of the food and spread into an interconnected mass called a mycelium. The mould plants get rid of their waste products through the mycelium and in the process contaminate the food.
2. Groups of stalks, which are all linked together and each have a sporangium containing spores, at the top. When ripe, each sporangium bursts and releases spores into the air. The spores travel through the air and land on the surface of another food. If the conditions are optimum, they germinate and new mould plants start to grow to continue the life cycle of the mould.

Although moulds are small plants, they are visible to the eye when they grow in large colonies on the surface of foods. The development and presence of moulds on food make it unfit to eat, except for those edible moulds that are used in the production of foods, such as blue-veined and soft cheeses, where they enhance the flavour and texture. They spoil food by being visibly present and producing unpleasant flavours and odours. Some pathogenic species of moulds also make food dangerous to eat, because they produce poisonous by-products called mycotoxins, which go into the food via the hyphae ('root' system) and can be harmful to humans and other animals if they eat the food. This can happen in foods such as cereal grains that become damp when they are stored.

Yeasts are single-celled fungi which reproduce in a different way from other fungi. They also need very similar optimum conditions as other moulds in which to grow and multiply. Yeasts reproduce by sending out a small bud from each yeast cell, which enlarges and eventually breaks away and becomes a separate yeast cell. If conditions are not favourable for reproduction, yeasts will form spores that germinate once optimum conditions return.

Yeasts spoil foods by the process of fermentation, which breaks down carbohydrates into carbon dioxide gas and alcohol (ethanol). They do this with a variety of enzymes, including zymase, which changes the sugars glucose and fructose into carbon dioxide gas and alcohol (ethanol), as shown in this chemical reaction:



This process is used for the production of fermented products such as bread wines, beers, etc., and is safe because the yeasts are used under controlled conditions.

Wild yeast spores are found in the air and will settle on foods, especially those that contain sugars, (e.g. the skins of berries, grapes, apples and other fruits) and start to ferment and spoil them. The yeasts appear as pale brown colonies on the skin of the decomposing fruit.

3. Discuss, giving details, explanations and examples, the impact of food poisoning and foodborne diseases on consumers, food businesses and their employees. (10 marks)

The answer should include:

- General definition of food poisoning and foodborne diseases, with examples of vulnerable groups, causes and legal requirements for reporting it. (2 marks)
- Impact on and implications for consumers – should include role of pathogenic bacteria and symptoms of food poisoning and foodborne diseases (with examples), plus other impacts on life and work. (4 marks)
- Impact on and implications for food businesses – should include role of Environmental Health Department and Officers, staff turnover, financial effects, effect on reputation. (2 marks)
- Impact on employees – should include loss of earnings, future employment, potential prosecution. (2 marks)

## Section C (case study)

A routine inspection of a restaurant kitchen by Environmental Health Officers reveals a number of food safety issues:

- Evidence of mouse/rat droppings at the back of food store cupboards and on the floor
- Evidence of fly larvae in containers of dry rice and flour
- A refrigerator with a loose door seal and an internal temperature of 10°C
- Evidence of cooked food being held at 59°C before serving
- Evidence of dampness in the dry foods storage area

Write a report about this inspection, in which you:

- Explain the implications of each of the five food safety issues listed above, for the health and safety of customers who eat food at the restaurant. (5 marks)
- Explain the improvements that the restaurant owner would need to make to the kitchen premises, equipment and food handling, preparation and cooking practices, in order to reach a good standard of food safety. (5 marks)
- Discuss, with reasons, the implications of the results of this inspection for customers of the restaurant, the employees and the future of the business. (4 marks)

The answer should include:

- Details and explanations (with examples) of the food safety violations, causes and potential risks to customer health for each food safety issue under the headings:
  - Pest control
  - Temperature control
  - Ventilation of premises
  - Food storage.
- Details and explanations (with examples) of the improvements needed to ensure the health and safety of future customers under the headings:
  - Kitchen premises: e.g. pest control measures, ventilation, food storage.
  - Equipment: e.g. regular checking of pest control equipment; regular checking and servicing of chilled storage equipment; checking hot holding equipment.
  - Food handling, preparation and cooking practices: e.g. improvements in training of staff to check temperatures, food storage and cleaning practices; development or improvement of HACCP.
- Details and explanations (with examples) of:
  - Customers:**
    - How customer safety has been put at risk (examples and details of food poisoning risks should be given).
    - How customer confidence would be affected by the risk of developing food poisoning and the poor hygiene rating that would be awarded to the business until improvements are made.
  - Employees:**
    - The effect of prosecution if it is proved that they have not followed food hygiene regulations.
    - Potential loss of earnings if the business has to be closed while improvements are made.
  - The future of the business:**
    - The effects of the inspection on their reputation and income.
    - Staff turnover may increase because they do not want to work in bad conditions.
    - Financial costs due to payment of fines, penalties, compensation and/or costs of improvements demanded by EHO.
    - Loss of food (and therefore money) if spoiled due to poor storage practices.
    - Possible closure of business by EHO and lost income whilst improvements are made.

**Chapter 2 Section A (short-answer questions)**

1. Explain what the following terms mean:

a) What is a food allergy? (1 mark)	<i>A food allergy is a serious and possibly life-threatening reaction to certain foods or ingredients added to foods, which can happen within a few seconds, minutes or hours after eating or being in contact with the food.</i>
b) What causes anaphylaxis? (1 mark)	<i>Anaphylaxis is a severe and dangerous allergic reaction (sometimes called anaphylactic shock), which is caused by the body's immune system reacting to an allergen in food and producing histamine, which leads to a variety of symptoms.</i>
c) Give three symptoms of anaphylaxis. (3 marks)	<p>Any of the following:</p> <ul style="list-style-type: none"> <li>● Swelling of the mouth, tongue and throat so the person cannot breathe, swallow or speak</li> <li>● Difficulty with breathing; wheezing and coughing</li> <li>● Dangerously low blood pressure</li> <li>● Weakness and inability to stand or sit properly</li> <li>● Possible collapse and unconsciousness, which can then lead to death</li> <li>● Skin becomes flushed and red</li> <li>● Raised, red/pink itchy rash on the skin (called urticaria or 'hives')</li> <li>● Skin swells on the face, lips, eyelids (angioedema)</li> <li>● The nose and eyes itch</li> <li>● Pain in the abdomen, nausea and vomiting.</li> </ul>
d) Describe how the body reacts to an allergen. (3 marks)	<i>In people who have an allergy, their immune system over-reacts to an allergen and produces an antibody called immunoglobulin E (IgE for short). This causes the body to produce chemicals, e.g. histamine, which cause the symptoms of an allergy.</i>
e) Name five foods that are known to cause food allergies. (5 marks)	<p>Any of the following:</p> <ul style="list-style-type: none"> <li>● Celeric</li> <li>● Celery</li> <li>● Citrus fruits</li> <li>● Eggs</li> <li>● Fish and shellfish</li> <li>● Kiwi fruit</li> <li>● Lupin beans</li> <li>● Milk and dairy foods</li> <li>● Mustard</li> <li>● Peanuts</li> <li>● Seeds</li> <li>● Some food preservatives (e.g. sulphur dioxide and sulphites)</li> <li>● Soya</li> <li>● Strawberries</li> <li>● Tree nuts, e.g. almonds, cashews, macadamias, walnuts, Brazil nuts, hazel nuts, pistachios and pecans.</li> </ul>

2. a) What is food intolerance?  
(1 mark)

*Food intolerance is the name given to a variety of symptoms that some people have after they eat certain foods, e.g. headache, migraine, abdominal bloating, diarrhoea, pains in the muscles and joints, eczema, dry skin conditions, weakness and chronic fatigue.*

b) What advice is given to people who think they may have a food intolerance, to find out and confirm the cause of their symptoms?  
(2 marks)

*They are usually advised to avoid eating the food they suspect is causing the symptoms, and to see what happens over a period of time. If the symptoms disappear, the suspected food should be gradually reintroduced to the diet to see if the symptoms reappear. If they do, then the person will be advised to permanently eliminate that food from their diet.*

c) What happens to villi in coeliac disease and why does this cause problems?  
(3 marks)

*In a person who does not have coeliac disease, the small intestine is lined with thousands of tiny projections called villi, which increase the surface area of the small intestine to allow as many nutrients as possible to be absorbed into the bloodstream. Coeliac disease is an autoimmune disease, where the body's immune system damages the villi when the protein gluten is eaten. The villi become inflamed and flattened and some may disappear (villous atrophy), therefore the damaged villi cannot absorb many nutrients (malabsorption). As a result, a coeliac will become malnourished and show signs of nutrient deficiency, as well as a range of other symptoms including tiredness, depression, mouth ulcers, liver problems, nausea, vomiting, abdominal pain, diarrhoea, bloating, nerve problems, anaemia, osteoporosis.*

d) What causes the symptoms of lactose intolerance? (3 marks)

*During digestion, the disaccharide lactose is broken down into glucose and galactose in the small intestine by an enzyme called lactase. The glucose and galactose are then absorbed into the bloodstream. People who are lactose intolerant cannot digest lactose, either because they have no lactase enzyme or not enough of it. This means that any lactose they ingest from milk and dairy foods is not broken down in the small intestine and travels into the colon, undigested. Bacteria in the colon then ferment the lactose and produce gases, such as carbon dioxide, hydrogen and methane. This causes bloating, flatulence, abdominal pain and sometimes nausea. The undigested lactose also causes water to be drawn into the colon, which causes diarrhoea. As a result, the person can feel very unwell.*

## **Section B (extended-answer questions)**

1. Explain the responsibilities of both customers and restaurant owners with regard to food allergies and intolerance. (10 marks)

The answer should include:

For restaurant owners:

- Reference to the EU Food Information for Consumers Regulation (EU FIC) requirement that food products must clearly show on their labels (i.e. on menus) whether they contain any of the fourteen most common foods that are known to cause food allergies and those that cause intolerance in some people.
- Ensuring that if food is declared to be 'gluten free' on a menu, it must not contain any more than 20mg of gluten in one kilogram of food, and cross-contamination must be prevented at all stages of production.
- Staff need to be educated and trained about how they handle food allergens – where they are stored, where they are prepared and cooked and the equipment used, how they are served, how to prevent food allergens from cross-contaminating other foods.
- The necessity for all staff to be trained to be aware of and understand the risks and consequences for allergic and food-intolerant customers of making the wrong choices and should be able to advise customers accordingly.
- Staff need to be trained about what to do in an emergency if a customer has an allergic reaction.
- Staff could be trained to use an EpiPen.
- Information about ingredients that can cause allergic reactions or intolerance symptoms should be available for customers to read without having to ask for it, e.g. on a menu or information board.
- Or, customers should be directed to where they can find out the information they need, e.g. a website or information booklet, or directed to ask a member of staff for the information about food product specification data, ingredient labels and recipes used in the restaurant.
- Staff need to be given this information in a clear and consistent form so that they all give accurate and consistent information to customers.

For customers:

- Customers are responsible for telling food handlers and businesses if they have an allergy or intolerance, so that they can be advised correctly.
- Allergic and food-intolerant customers should read menus very carefully and ask questions about the foods on sale and how they have been prepared and cooked when making their choices.

2. Explain, giving reasons and examples, why someone with a food allergy should carefully read food labels and how they can avoid the risk of having an allergic reaction when they go out to eat. (8 marks)

*For people who have food allergies, the only certain way to avoid an allergic reaction is to avoid eating and being in contact with the food that causes the allergy. There are many foods that are the cause of many allergic reactions and the EU Food Information for Consumers Regulation (EU FIC) requires that food products must clearly show on their labels and menus whether they contain any of the fourteen most common foods that are known to cause food allergies in some people, which include celery, citrus fruits, eggs, fish and shellfish, milk and dairy foods, peanuts, seeds and tree nuts.*

*Many people who have a food allergy often have an EpiPen with them, which is a medical device for injecting a dose of adrenaline into someone who is having an anaphylaxis reaction. It helps to control their symptoms while they are being taken to hospital for specialist treatment for their allergy. People who work in the Hospitality and Catering industry or who work with children should be trained to know how to use these. It is advisable for an allergic person to tell their friends and family about their allergy and teach them how to recognise the symptoms of an allergic reaction, what to do, and how to use the EpiPen in case of an emergency.*

*Someone who is allergic to certain foods must avoid eating them, read food labels and menus very carefully and know how these foods may appear in a list of ingredients on a food label. For example, whey protein is often added to processed foods, such as savoury crackers, vegetable fat spread, sausages, cakes and sweets, so someone who is allergic to dairy foods needs to know this. This also applies to medicines and nutritional supplements, as some contain arachis oil from peanuts, which may contain a trace of peanut protein and could cause an allergic reaction. If allergic people eat a meal out of the home, they should also check with the shop or restaurant whether the food has been prepared in an area where the food they are allergic to has also been prepared, as cross-contamination may occur.*

### **Section C (case study)**

A new day care nursery for pre-school children is being opened. The nursery will provide lunch and healthy snacks and drinks for the children every day.

- a) With regard to food allergies and intolerances, explain the responsibilities of the nursery owners and staff and the parents and carers. (8 marks)
- b) Plan a menu for five days' lunches, healthy snacks and drinks that demonstrates awareness and due diligence with regard to food allergens and intolerances, in terms of which food and drinks are provided and how ingredients and foods are stored, prepared, cooked and served. (10 marks)

The answer should include the need for thorough and regular training of all nursery staff so that they know about and understand:

- The risks and consequences of food allergies and intolerances for children.
- What symptoms to look out for when a child has a food allergy or intolerance.
- The fourteen most common foods/ingredients that are known to cause food allergies.
- How to plan menus that do not include foods that commonly cause food allergies or intolerances.
- How to handle food allergens – where they are stored, where they are prepared and cooked and the equipment used, how they are served, how to prevent food allergens from cross-contaminating other foods.
- What to do in an emergency if a child has an allergic reaction.
- How to use an EpiPen.
- The need to inform and advise parents on how the nursery aims to keep their children safe, and the need for parents to inform the nursery if there are any issues with their children's diet.
- The need to produce a HACCP that includes food safety in terms of allergies and intolerances as well as prevention of food poisoning.

**Chapter 3 Section A (short-answer questions)**

1. List four issues in relation to the production, sale and consumption of food that food safety legislation is concerned with.

(4 marks)

Any four of the following:

- Ensuring that food is safe and fit for human consumption
- Checking and controlling the composition and labelling of foods
- Preventing food from becoming contaminated
- Preventing outbreaks of food poisoning
- Ensuring that equipment, food handlers and premises are hygienic
- Ensuring that food handlers are trained to understand and implement food hygiene and safety practices
- Ensuring that temperature and other controls are correct for the processing, transport, storage, preparation, cooking and consumption of food
- Ensuring that water supplies and food handler toilet and washing facilities are safe and hygienic
- Ensuring that food businesses implement a food safety management system of compliance based on risk assessment through Hazard Analysis of Critical Control Points (HACCP)
- Registration, licensing and monitoring of food premises and transport vehicles.

2. In food safety legislation, what is a system of compliance? (1 mark)

*A system of compliance, such as Hazard Analysis of Critical Control Points (HACCP), is a method of identifying and controlling potential food safety hazards, and is used to ensure that compliance with the law is upheld.*

3. Give four legal requirements for the premises in which food businesses operate. (4 marks)

Any four of the following:

The premises where food is prepared must:

- be clean and maintained in good repair
- be designed and built in a way that allows good hygiene practices to take place
- have a sufficient supply of good quality hot and cold potable (safe for drinking) water
- have suitable controls in place to protect against contamination by pests, e.g. rats and mice, flies, ants, cockroaches, birds
- have adequate natural and/or artificial lighting
- have sufficient natural and/or mechanical ventilation and/or air conditioning – windows that open should be protected by removable and washable fly screens and not allow pollution from outside to enter
- have ceilings and light fittings that are designed and constructed so that they do not allow the accumulation of dirt or condensation, do not encourage mould growth and do not drop particles
- provide clean staff toilets, which do not lead directly into food rooms
- have proper and hygienic hand-washing facilities for staff
- have sufficient drainage to get rid of dirty water from sinks, floors and other areas
- have surface finishes, i.e. walls, floors, doors, ceilings, worktops, shelves, cupboards, that are in good condition, smooth (to prevent the accumulation of dirt), impermeable to water, do not corrode, non-toxic, and easy to clean and disinfect (e.g. stainless steel)
- have proper and sufficient facilities for washing food and equipment
- have proper and sufficient facilities for storing and removing food waste
- have proper and sufficient space and facilities to prepare, cook and serve food safely
- have a separate storage area for cleaning materials and equipment well away from food preparation areas
- have an air temperature no higher than 26°C in cooking areas and from 16 to 18°C in food preparation areas
- have no more than 60% humidity to prevent growth of moulds and slip accidents
- have signage throughout the food preparation areas to alert and remind food handlers of their food hygiene and safety and personal safety responsibilities.



4. Explain what cross-contamination means and give four examples of the vehicles by which food can become contaminated.

(6 marks)

*Cross-contamination is the transfer of bacteria from contaminated foods, liquid and solid substances, surfaces, materials or animals to other foods. Most bacteria cannot move by themselves (apart from those types that can move through liquids) and rely on other things, known as vehicles, to transfer them to food, e.g.:*

- *hands, including shaking hands with another person*
- *equipment, e.g. knives and tongs being used for raw then cooked foods without washing in between*
- *cloths, e.g. a hand-drying towel in the toilets being used by different people; dishcloths*
- *hand-contact surfaces, e.g. door handles and taps*
- *contaminated food touching another food*
- *drip of liquids from a contaminated food onto another food*
- *pests – insects, animals, birds*
- *dust, soil, water, rubbish, air*
- *a nailbrush used by different people.*

5. What are the safe temperatures for each of the following? (4 marks)

a) The storage of refrigerated high-risk foods	0°to 5°C
b) Cooking high-risk foods	Core temperature: minimum 70°C for 2 minutes
c) Re-heating cooked and chilled foods	Core temperature: minimum 70°C for 2 minutes in England, Wales and Northern Ireland; minimum of 82°C in Scotland.
d) Hot holding cooked food for service	Core temperature: minimum 63°C

### Section B (extended-answer questions)

1. The Food Safety Act stipulates that food for sale must be of the 'nature, substance or quality demanded by the consumer'. Explain what this means, giving examples. (8 marks)

*The 'nature, substance or quality demanded by the consumer' means that the food must be what people expect it to be and not labelled, advertised or presented in a way that is false or misleading. Food must be safe to eat and have had nothing added to it or taken out of it that would make it unsafe for people to eat.*

*The 'nature' of food means it is illegal to use a different kind or variety of food from that stated on the label, e.g. if a ready meal is advertised as containing beef, it must be all beef and not include or be substituted by another meat.*

*The 'substance' of food means it is illegal to use an ingredient such as a colouring, flavouring or preservative that has not been approved for use in food produced for humans or is not a proper ingredient of that food, e.g. adding ground papaya seeds to ground black pepper; adding powdered red brick to chilli powder or diluting milk with water.*

*The 'quality' of food means it is illegal to use inferior quality ingredients, e.g. selling food products for people that are meant to be used for pet food only; or selling a cake with a 'fresh cream' filling, in which the filling is actually an artificial cream made from vegetable oils.*

2. Explain what a system of compliance is in food safety legislation. Give an example of such a system and explain, with details and examples, how it aims to enable food businesses to comply with the law. (8 marks)

The answer should:

- Include the definition of a system of compliance and due diligence.
- Use the example of HACCP and describe what it aims to do.
- Use a scenario to explain how HACCP works in practice.
- Cover each operation stage and critical control points, hazard analysis and controls in place to prevent the risk of food poisoning.

3. Discuss, giving detailed reasons, explanations and examples, the importance of the dress code for food handlers in catering kitchens. (8 marks)

*The dress code for food handlers in catering kitchens is to wear the traditional cook's/chef's uniform, which represents the business, gives a professional image and is clean, hygienic, neat and tidy.*

*The uniform is usually made of strong cotton material and consists of a hat, necktie, long-sleeved, double-cuffed, double-breasted, white cotton buttoned jacket, knee-length cotton apron, long cotton trousers and sturdy, well-fitting, slip-resistant shoes, with toe protectors and low heels.*

*It is designed to protect the body, especially the chest and arms, from burn injuries caused by splashes and spills from boiling hot liquids or heat rays from grills and ovens. This is why the jacket has four layers of cotton over the chest area.*

*It is also designed to fit the body well and be comfortable to wear while working in a hot and steamy kitchen, because the cotton material will absorb sweat. It is a hygienic barrier between the food handler and the food. Cotton can be washed at very high temperatures, which is necessary to remove stains, food residues and bacteria that build up on the uniform during food preparation and cooking. When clean and ironed, the uniform looks clean, fresh and smart.*

*Food hygiene regulations say that cooks and chefs should change into their uniform at their place of work because if they wear their uniform in public areas like buses and trains, it will become contaminated by microbes and other substances. Their chef's jacket, apron and necktie should be changed at least once a day, and their hat and trousers as soon as they become dirty. The uniform should always be washed before wearing it again. A hair net or beard net/snood should be worn if the food handler's hair is longer than their collar line or a full beard is worn.*

*The dress code also includes jewellery, make up and scents. Jewellery must not be worn in the kitchen as it can collect food residues and become a food safety hazard. Heavy make-up, false nails and nail polish must not be worn, as they also can become a food safety hazard, e.g. a false eyelash or false nail may fall into or come off in the food when it is being prepared. Strong scents should not be worn as they can taint the food.*

## Section C (case study)

A new restaurant is opening in the centre of a town and the management are recruiting staff to work in the kitchen and front of house (bar and restaurant).

You have been asked to prepare and distribute an induction booklet for new staff to include the following information:

- Why it is important that the new restaurant fully complies with food safety information. (4 marks)
- The responsibilities of the managers of the business to ensure that there are no food safety problems or issues for the staff or customers. (4 marks)
- The responsibilities of all food handlers in the restaurant to ensure that there are no food safety problems or issues for the staff or customers. (4 marks)
- A comprehensive list of rules related to personal hygiene and uniform requirements. (4 marks)

The answer should include:

- Information with details and examples about:
  - the laws in relation to food safety
  - the penalties for failure to comply with the laws.
- Information with details and examples about:
  - staff training
  - developing and using the HACCP system of compliance
  - ensuring the regular servicing/inspection of premises, equipment, processes and practices
  - providing food safety assurance information for customers.
- Information with details and examples about:
  - attending and applying what is taught in staff training
  - safeguarding the safety of customers and fellow workers
  - the procedure for reporting any problems to management.
- Information with details and examples about:
  - essential food and personal hygiene practices
  - clear instructions about the dress code for front and back of house staff.

## Chapter 4 Section A (short-answer questions)

1. Explain what the term 'nutrient density' means, giving two examples to illustrate your answer. (3 marks)

- *Definition of nutrient density: A measure of the number and quantity of different nutrients a food contains.*
- *Examples of a food with high nutrient density, e.g. whole milk, wholegrain cereals, eggs, spinach; compared to examples of a food with low nutrient density, e.g. white sugar, cornflour.*

2. Explain what 'biological value' means and give an example to illustrate your answer. (3 marks)

- *Definition of biological value: How much of a nutrient in a food is used by the body, after the nutrient has been digested and absorbed from the small intestine and how this is affected by a number of factors, e.g. how food was grown/reared.*
- *Example should show understanding of the term: e.g. the biological value of protein is measured by comparing the amount of protein eaten with the amount of nitrogen excreted in urine.*

3. What are phytochemicals? Give two examples to illustrate your answer. (3 marks)

- *Definition of phytochemicals: Natural chemical substances found in plant foods, many of which are known to be beneficial to body health.*
- *Examples should give some of their health benefits to illustrate the definition, e.g. polyphenols, found in fruits, nuts and vegetables:*
  - *Many are antioxidants*
  - *Many protect the body against the development of certain cancers*
  - *Some strengthen the body's immune system*
  - *Some protect the body from micro-biological illnesses*
  - *Some help prevent the development of blood clots (thrombosis)*
  - *Some help to prevent inflammation in the body*
  - *Some help to regulate blood pressure*
  - *Some help to regulate blood glucose levels.*

4. Give two reasons why the quantity of a nutrient may vary in different samples of the same food. (3 marks)

- *The freshness of the sample of food being tested: some nutrients start to break down and are lost the longer a food is stored.*
- *The variety of plant or animal food being used in the test: e.g. one variety of apple may naturally contain a different amount of vitamin C from another variety.*
- *How the plant or animal food was grown/reared: e.g. the type of soil a plant food grew in, which will affect how many minerals the plant had access to; or the type of food a chicken was given to eat.*
- *The way the food was processed, preserved or cooked: e.g. boiling plant foods in water will destroy some of the vitamin C they contain.*

## Section B (extended-answer questions)

1. Discuss the use of the glycaemic index in helping to reduce the risk of developing Type 2 diabetes. (10 marks)

Answer should include detailed reference to the following, with examples:

- Definition of glycaemic index: A system for rating carbohydrate foods according to how rapidly and by how much they individually raise the blood glucose level in a person.
- Definition of Type 2 diabetes and why it is a health issue.
- How foods raise blood glucose levels (glycaemic response).
- Why lower GI rated foods (examples) are better at preventing Type 2 diabetes than higher GI rated foods (examples).

2. When assessing the nutritional status of a person, why do many nutrition experts think that it is more important to consider their diet as a whole rather than focusing on individual nutrients? (10 marks)

Answer should include detailed reference to the following, with examples:

- The importance of why the diet should be considered as a whole.
- Understanding of the complexity of food composition, not just a focus on nutrients.
- A clear understanding (with a variety of examples) of the ways in which nutrients and other natural substances in foods all work together in very complex chemical reactions (complementary interactions) to maintain the body and health.

*Nutrition is the study of what people eat and how all the natural substances (including nutrients) in foods work together in the body to enable it to grow, stay healthy and function properly. Good nutrition throughout life enables people to stay healthy, i.e. eating a wide variety of foods (mainly plant foods), that are mostly unprocessed (whole foods), and drinking plenty of water.*

*All foods are composed of many hundreds of different chemical substances, some of which are a natural part of the food, e.g. phytochemicals produced by plants which give them a natural colour, flavour, scent/aroma; enable them to resist disease or attacks by predators; enable them to grow and reproduce. In animals, cows and other mammals produce milk, which contains large numbers of different natural substances that enable their baby to grow and develop and resist disease.*

*Many of the chemical substances found naturally in foods, e.g. phytochemicals in plants, have been identified as being beneficial to people's life and health. Some of these natural substances are known to be essential for our bodies to grow, work properly and stay healthy – we have to obtain them from food. These essential substances are called nutrients. There are five groups that we currently know about:*

- *Macronutrients: protein, lipids (fat), carbohydrate*
- *Micronutrients: vitamins and minerals.*

*Nutrients and other natural substances in foods do not work individually: they all work together in very large numbers of complex and complementary chemical interactions throughout the body to maintain health, e.g. vitamin C enables iron to be absorbed into the body in the small intestine; vitamin B<sub>9</sub> and vitamin B<sub>12</sub> work together to produce new red blood cells; specialised proteins act as carriers to move nutrients around the body, including iron, copper, calcium, vitamins A and D, and fats (lipids) and many phyto-oestrogens and polyphenols in plant foods are antioxidants, strengthen the immune system and protect the body against the development of certain cancers.*

*The food people eat every day is called their diet. A balanced diet is one that provides a person with the right amount of nutrients for their needs. When thinking about what people eat, many nutrition experts think it is important not just to focus on individual nutrients, but to look at their diet as a whole – i.e. everything they eat and drink over a given period of time – the variety of whole foods (and therefore natural substances) it contains and therefore how nutrient dense it is. It is also because when someone eats a meal, they are not just eating one or two nutrients and a few other natural chemical substances – they are eating thousands of these due to the variations in what each of the foods contains. If people regularly eat a wide variety of mostly unprocessed foods (often called wholefoods), especially plant foods, they will provide their body with a wide variety of materials, including nutrients.*

3. Discuss nutritional labelling by analysing how and why it is used on food products. (10 marks)

Answer should include detailed reference to the following, with examples:

- The purpose of nutritional labelling.
- Legal requirement.
- How and why the information must be presented on food labels, with examples.
- The purpose and format of the front-of-pack colour-coded labelling scheme, with examples.
- How labelling and colour coding relates to Reference Nutrient Intake /Guideline Daily Amount, with examples.

4. Discuss the importance of understanding the complementary actions of nutrients when considering the nutritional status of a person. (8 marks)

Answer should include detailed reference to the following, with examples:

- Definition of the complementary actions of nutrients.
- Examples of the complementary actions of nutrients, e.g. proteins.
- How this information relates to the nutritional status of groups of people such as teenage girls (prevention of anaemia), children, adolescents, young adults and pregnant/lactating women (development of skeleton/peak bone mass); athletes (energy release from carbohydrates); prevention of cell damage by free radical (role of antioxidants)

### Section C (case study)

Kim is 25 years old, overweight, has been diagnosed with Type 2 diabetes and has slight iron deficiency anaemia. Kim is very keen to make diet and lifestyle changes in order to try to lose weight and reduce the symptoms of the diabetes and anaemia.

Explain how a knowledge and understanding of the following would help someone like Kim to achieve these goals: (2 marks each)

	The answer should include:
a) Good nutrition and malnutrition.	<ul style="list-style-type: none"> <li>● Definition of good nutrition: Eating a wide variety of foods (mainly plant foods), that are mostly unprocessed (whole foods), and drinking plenty of water.</li> <li>● Benefits of good nutrition.</li> <li>● Negative effects of malnutrition and how this creates conditions for health disorders to develop: Definition of Type 2 diabetes and iron deficiency anaemia and how and why these are examples and evidence of malnutrition.</li> </ul>
b) Nutritional value.	<ul style="list-style-type: none"> <li>● A knowledge of nutritional value will help Kim understand what she is eating, to help her make changes and reach her goals – give examples.</li> </ul>
c) Nutritional labelling.	<ul style="list-style-type: none"> <li>● How to read nutritional labels will enhance Kim's understanding of nutritional value – give examples.</li> </ul>
d) Nutrient and energy density.	<ul style="list-style-type: none"> <li>● Give definitions of nutrient and energy density with examples.</li> <li>● Explain how an understanding of these will enable Kim to make informed food choices and help her make changes and reach her goals – give examples of choices she could make.</li> </ul>
e) Glycaemic index.	<ul style="list-style-type: none"> <li>● Give definition of glycaemic index and how foods raise blood glucose levels (glycaemic response).</li> <li>● Explain how an understanding of GI can help Kim to manage her Type 2 diabetes more effectively.</li> <li>● Why choosing lower GI rated foods (examples) will help Kim to manage her Type 2 diabetes rather than choosing higher GI rated foods (examples).</li> </ul>
f) Complementary interactions of nutrients.	<ul style="list-style-type: none"> <li>● Give a definition of the complementary actions of nutrients with examples.</li> <li>● Explain how this information relates to Kim's nutritional status (prevention of anaemia and management of Type 2 diabetes).</li> </ul>

NB: the use of diagrams to help explain answers is appropriate and recommended for many of the questions in this chapter.

**Chapter 5 Section A (short-answer questions)**

The answers should include all or some of the following:

<p>1. Explain what a peptide bond is. (2 marks)</p>	<p>Answer should include reference to the following, with examples including chemical reactions:</p> <ul style="list-style-type: none"> <li>• Amino acids; amino group (NH<sub>2</sub>); carboxyl group (COOH)</li> <li>• Condensation reaction – loss of water molecule.</li> </ul>
<p>2. Describe the four stages of folding in protein molecules. (4 marks)</p>	<p>Answer should include reference to the following, with examples including chemical reactions/diagrams:</p> <ul style="list-style-type: none"> <li>• Polypeptides</li> <li>• Hydrogen bonds; sulphur-to-sulphur (disulphide) bridges</li> <li>• Need for compactness of protein molecules – give example</li> <li>• Primary structure</li> <li>• Secondary structure – folded sheet; helix</li> <li>• Tertiary structure</li> <li>• Quaternary structure.</li> </ul>
<p>3. Explain the difference between a HBV protein and a LBV protein. (2 marks)</p>	<ul style="list-style-type: none"> <li>• LBV and HBV should be defined by reference to the number of essential amino acids they contain (give examples of their names)</li> <li>• Reference should be made to the complementary action of proteins (protein complementation).</li> </ul>
<p>4. Describe how fatty acids combine with glycerol to form a triglyceride. (2 marks)</p>	<p>Answer should include reference to the following, with examples including chemical reactions/diagrams:</p> <ul style="list-style-type: none"> <li>• Define: triglyceride; glycerol; fatty acid; carboxyl group (COOH)</li> <li>• Condensation reaction – loss of water molecule.</li> </ul>
<p>5. Explain the difference between saturated and monounsaturated fatty acids. (2 marks)</p>	<ul style="list-style-type: none"> <li>• NB: The question is about saturated and monounsaturated fatty acids, <b>NOT</b> fats. Students must clearly show that they understand this, as in this example answer:</li> </ul> <p><i>Fatty acids which, with glycerol, form triglyceride molecules, are usually classified as saturated, monounsaturated or polyunsaturated depending on the chemical structure of their carbon and hydrogen chains. Saturated fatty acids have all of the hydrogen atoms that can be held by the carbon chain and are therefore saturated with hydrogen. Their linear shape allows them to pack closely together, which gives them a rigid, stable structure, meaning that they are unlikely to react with other chemicals. Generally, fats that contain a high percentage of saturated fatty acids are solid at room temperature and have a high melting point. They tend to be of animal origin, for example cow's milk butter, as it contains more saturated fatty acids than unsaturated fatty acids.</i></p> <p><i>Monounsaturated fatty acids have some hydrogen atoms missing from the chain of carbon atoms; resulting in the formation of one double bond between two carbon atoms in the chain. The double bond within a monounsaturated fatty acid chain reduces the stability of the molecule and is a point of weakness. The double bond puts a curve in the otherwise straight carbon chain, which prevents it from packing tightly together in a rigid structure. Monounsaturated fatty acids have lower melting points than saturated fatty acids and fats that contain a higher percentage of monounsaturated fatty acids compared to saturated fatty acids tend to be oils and are liquid at room temperature, e.g. fish oils and olive oil.</i></p>

<p>6. What does the word 'rancid' mean? (2 marks)</p>	<p>Answer should include reference to the following:</p> <ul style="list-style-type: none"> <li>● Define rancidity: oxidation</li> <li>● Characteristics of a rancid fat.</li> </ul> <p><i>An oil or fat becomes rancid when oxygen is allowed to break it down by a process called oxidation. Rancidity is characterised by the development of highly reactive chemicals which produce unpleasant, sharp and powerful off-flavours and odours in a food. Oils that have a high proportion of unsaturated fatty acids are more likely to become rancid than oils that have a high proportion of saturated fatty acids because of the number of double bonds they contain. These bonds are easily broken, causing the fatty acids to break up into smaller compounds that react with oxygen and cause the food to become inedible. Rancidity also destroys some of the nutrients in food, e.g. vitamins.</i></p>
<p>7. Explain the similarities and differences between starch and cellulose molecules. (2 marks)</p>	<p>Answer should include reference to the following, with examples including chemical reactions/diagrams:</p> <ul style="list-style-type: none"> <li>● Define: complex carbohydrates (polysaccharides)</li> <li>● Starch:             <ul style="list-style-type: none"> <li>• Amylose – 1, 4 [alpha] <math>\alpha</math>-glycosidic bonds – linkages</li> <li>• Amylopectin – 1-6 bonds or linkages</li> </ul> </li> <li>● Cellulose – 1, 4 <math>\beta</math>-glycosidic bonds – linkages.</li> </ul>
<p>8. Why is it not possible for humans to digest cellulose? (1 mark)</p>	<p>Answer should include reference to the following:</p> <ul style="list-style-type: none"> <li>● Role of cellulase in hydrolysing cellulose.</li> </ul> <p><i>In the polysaccharide cellulose, the glucose molecules are in the beta form and are joined together by 1, 4 <math>\beta</math>-glycosidic bonds/linkages. Some animals, e.g. cattle, have bacteria in their gastro-intestinal tract that produce the enzyme cellulase, which is able to hydrolyse the 1, 4 <math>\beta</math>-glycosidic bonds and break down cellulose during digestion. Humans do not have bacteria that produce cellulase and so cannot break it down. Therefore, the cellulose eaten in plant foods passes through the digestive system as dietary fibre.</i></p>

## Section B (extended-answer questions)

<p>1. Using your knowledge of the structure of lipids, explain why and how a block of butter changes when it is removed from a refrigerator and is left in a warm kitchen for several hours. (8 marks)</p>	<p>Answer should include reference to the following, with examples including chemical reactions/diagrams:</p> <ul style="list-style-type: none"> <li>● Types/ratios of fatty acids in butter</li> <li>● How the working properties, melting points and physical characteristics of butter change from being in refrigeration, to ambient to hot temperatures</li> </ul>
<p>2. Explain why dietary guidelines and health experts encourage the daily consumption of fresh fruits and vegetables. (8 marks)</p>	<p>Answer should include reference to the following:</p> <ul style="list-style-type: none"> <li>● Phytochemicals in these foods</li> <li>● Macronutrients and dietary fibre they contain</li> <li>● Micronutrients they contain, especially vitamins A, C, E, calcium, iron and other micronutrients</li> <li>● Antioxidants/free radicals</li> <li>● Sources of vitamin B group</li> <li>● Interactions of vitamins and minerals</li> <li>● Effects of phytates and oxalates on minerals</li> <li>● Non-haem iron and the role of vitamin C</li> <li>● Water.</li> </ul>

3. Describe why and how glycogen is synthesised in the body, and how the release of the energy it provides is controlled. (8 marks)

Answer should include detailed reference to the following, as in the example answer to the right:

- Polysaccharide /glucose – 1-4 glycosidic bonds
- Liver and muscles
- Glycogenesis: the roles of glycogenin, glycogen synthase; adrenalin [epinephrine], insulin and calcium ions
- Glycogenolysis: the roles of glucagon and insulin; adrenalin [epinephrine], flight or fight response.

*Glycogen is the only polysaccharide that is made by some animals, including humans. It is used to store glucose in the liver and muscles, so that it can be easily accessed when energy is needed quickly, e.g. for running or moving quickly away from danger. It is formed of chains of glucose molecules joined by 1-4 glycosidic bonds, with many branches leading off the chains in 1-6 linkages, similar to amylopectin. It is stored in the liver and muscles in the form of granules. At the centre of each glycogen granule is a protein molecule called glycogenin.*

*Glycogen is synthesised from glucose during the process of glycogenesis, which takes place in the liver. The process is controlled by the enzymes glycogenin and glycogen synthase, the hormones adrenalin [epinephrine] and insulin and also calcium ions.*

*The stored glucose and the energy it contains is released from glycogen during the process of glycogenolysis in the liver and muscles. The process is regulated and controlled by the hormones glucagon and insulin, which respond to the levels of glucose in the blood to ensure that it stays at a constant level. If the body requires a sudden increase in energy, e.g. to run fast or respond to a threat (often called the fight or flight response), the hormone adrenalin [epinephrine] is produced by the adrenal glands, which stimulates glycogenolysis to take place.*

4. Explain the following processes in the body:

a) The biogenesis of vitamin D. (4 marks)

Answer should include detailed reference to the following:

- Ultraviolet light
- Provitamin D (called 7-dehydrocholesterol)
- Cholecalciferol
- 25-hydroxycholecalciferol
- 1,25-dihydroxycholecalciferol
- Liver and kidneys.

*The chemical name for vitamin D is cholecalciferol, which is the form of vitamin D that the body obtains from foods such as liver and liver oils and dairy products. The biogenesis of vitamin D from the action of ultraviolet light from sunlight on the skin is the main source of the vitamin, and this is what happens:*

*Ultraviolet light from the sun stimulates provitamin D (called 7-dehydrocholesterol) under the skin, to convert to cholecalciferol. Cholecalciferol is then converted to 25-hydroxycholecalciferol in the liver, then converted in the kidneys to 1,25-dihydroxycholecalciferol, which is the active form of the vitamin that the body uses.*

b) The role of phospholipids in cell membranes. (4 marks)

*Phospholipids are lipid compounds that have two hydrophobic ('water hating') fatty acid tails and a hydrophilic ('water loving') phosphate head. In cell membranes, these line up in two rows, called a bilayer, with the tails facing each other, and they only allow certain molecules to pass through in or out of the cell.*

c) The role, transport and storage of iron in the body. (4 marks)

Answer should include detailed reference to the following:

- Haemoglobin
- Oxygen
- Red blood cells
- Transferrin
- Toxicity of iron
- Ferritin



**Section C (case study)**

A summer heatwave has led to concerns for the welfare of elderly patients in a care home; in particular, about their intake of water and their risk of becoming dehydrated.

1. Explain why the body needs water and why the health of elderly patients is put at risk if they do not drink enough water during a heatwave. (4 marks)

Answer should include reference to the following:

- The role of water in:
  - Metabolic demands of the body
  - Catalyst for enzymic reactions – give examples
  - Excretion of metabolic waste products
  - Body temperature control
  - Blood pressure
  - Electrolyte balance
- Effects on health of insufficient fluid intake in elderly patients: dehydration; drop in blood pressure; risk of developing urinary tract infections, inability to control body temperature; strain on kidney function.

2. Explain the importance of water balance in the body and the signs of dehydration the care staff in the home should watch out for in their elderly residents. (4 marks)

Answer should include reference to the following:

- Water balance: fluids and electrolytes
- Water intake/sources
- Water output; role of antidiuretic hormone (ADH); hypothalamus; kidneys; thirst.
- Symptoms of dehydration:
  - Headache, nausea, weakness, delirium (confusion), and hyperthermia (overheating)
  - Skin looks wrinkled and does not spring back when pinched
  - Skin folding on the forehead
  - Significantly decreased urine output
  - Very concentrated urine
  - Sunken eyes
  - Dry mucous membranes in the mouth and nose
  - Blood pressure changes
  - Tachycardia - abnormally rapid heart rate.

3. Suggest some different ways in which the residents in the care home could be encouraged to take in more water in their diet. (4 marks)

Answer should include reference to the following:

- Beverages – hot and cold
- Water in solid foods
- Fruits/vegetables
- Soups/stews
- Salads
- Smoothies/fruit juices with ice cubes
- Jellies
- Ice lollies/sorbets

### Chapter 6 Section A (short-answer questions)

1. What does the term nutrient profile mean? (1 mark)	<i>The different types and quantities of nutrients that a specific food contains.</i>
2. Explain what leaching means and give two examples of nutrients that are affected by it. (3 marks)	<ul style="list-style-type: none"> <li>● The loss of a nutrient from a food by it dissolving in the water it is cooked in. Answer should give two examples.</li> </ul>
3. Give two examples of how vitamin C is affected by preparation and cooking processes. (2 marks)	<p>Answer could reference any two of the following:          Oxidation; enzyme action; heat; leaching; alkalis.</p>

### Section B (extended-answer questions)

1. Explain, giving reasons and examples, how each of the following factors influences the nutrient profile of foods:	
a) The environment in which foods were grown or reared. (3 marks)	<p>Answer should include reference to the following, with examples:</p> <ul style="list-style-type: none"> <li>● Soil quality – minerals, organic matter, water, microbes</li> <li>● Living conditions</li> <li>● Level of stress</li> <li>● Disease</li> <li>● Diet.</li> </ul> <p><i>The environment in which foods are grown or reared influences their nutrient profile in the following ways.</i></p> <p><i>For plants, if the soil in which they are grown is of good quality and rich in minerals, organic matter, water and micro-organisms, there will be plenty of materials available for the plants to extract from the soil to grow healthily and their nutrient profile will be dense and varied. If the quality of the soil is poor, plants will not have enough materials to make all the natural phytochemicals (including nutrients) they need and therefore they will have a poor nutrient profile.</i></p> <p><i>For animals that are reared as livestock (mammals, fish, and birds), good living conditions, a natural mixed and balanced diet, enough water and a stress- and disease-free environment will allow them to grow normally and stay healthy and therefore produce good quality meat and products such as eggs and milk, with good nutrient profiles.</i></p>
b) The length of time foods are stored after harvest or slaughter. (3 marks)	<p>Answer should include reference to the following with examples:</p> <ul style="list-style-type: none"> <li>● Effects of enzyme and bacterial activity on composition and nutrient activity</li> <li>● Effects of temperature and time on composition and nutrients.</li> </ul>
c) The variety or species of animal. (3 marks)	<p>Answer should include reference to the following with examples:</p> <ul style="list-style-type: none"> <li>● Variations in composition and nutrient profile</li> <li>● Cross-breeding.</li> </ul>
2. Explain, giving reasons and examples, why the following practical advice is given when buying, storing, preparing and cooking fruits and vegetables:	
a) Avoid buying damaged and bruised fruits and vegetables. (2 marks)	<p>Answer should include reference to the following, with examples:</p> <ul style="list-style-type: none"> <li>● Effects of enzyme and microbe activity on composition, organoleptic qualities and nutrient activity caused by bruising/cell damage.</li> </ul>
b) Store foods for as little time as possible. (2 marks)	<p>Answer should include reference to the following with examples:</p> <ul style="list-style-type: none"> <li>● How nutrients are gradually lost as a result of enzyme and microbe activity</li> <li>● Richer nutrient profile straight after slaughter or harvest.</li> </ul>
c) Cut, grate, squeeze, or chop fruits and vegetables just before cooking. (2 marks)	<p>Answer should include reference to the following with examples:</p> <ul style="list-style-type: none"> <li>● Effects on nutrients of exposure to oxygen.</li> </ul>

<p>d) Use only a little water for cooking fruits and vegetables and cook for the minimum amount of time needed to tenderise them. (2 marks)</p>	<p>Answer should include reference to the following with examples:</p> <ul style="list-style-type: none"> <li>● Effects on nutrients of exposure to water and heat.</li> </ul>
<p>e) Save the cooking water from vegetables and use it in gravy/soup/sauces. (2 marks)</p>	<p>Answer should include reference to the following with examples:</p> <ul style="list-style-type: none"> <li>● Leaching of nutrients.</li> </ul>

<p>3. The processing of some foods can result in nutrient instability and loss. Explain the ways in which nutrients can be added to foods to compensate for this. (3 marks)</p>	
	<p>Answer should include reference to the following, with examples:</p> <ul style="list-style-type: none"> <li>● Enrichment</li> <li>● Restoration</li> <li>● Standardisation.</li> </ul>

<p>4. Explain, giving reasons and examples, how the following nutrients are affected by cooking</p>	
<p>a) Protein (6 marks)</p>	<p>Answer should include reference to the following with details and examples:</p> <ul style="list-style-type: none"> <li>● Amino acids; polypeptide bonds; compact molecules</li> <li>● Effects of heat, pH and mechanical agitation</li> <li>● Denaturation</li> <li>● Coagulation</li> <li>● Solid and gel texture formation.</li> </ul> <p><i>Proteins are made of long polypeptide chains of amino acids that are folded in complex ways to form large, compact protein molecules. The molecules are held together by hydrogen and disulphide bonds between the folded polypeptide chains. These bonds can be disturbed and broken by heat, pH (especially acids) and mechanical action (e.g. whisking), resulting in the unravelling and reshaping of the protein molecules. This process is known as denaturation.</i></p> <p><i>When they are unravelled, denatured protein molecules take up a greater amount of space and start to mix with other denatured protein molecules nearby, forming solid and gel textures as new bonds are formed between them, depending on the food. This process is called coagulation.</i></p> <p><i>In eggs, for example, heating causes denaturation of the egg white proteins (ovotransferrin and ovalbumin) between 60 and 80 °C, which gradually coagulate to form a solid, opaque gel in which water molecules from the egg white are trapped. The egg yolk proteins (a group called ovovitellin) coagulate between 65 and 70 °C and become solid. The ability to denature and coagulate makes eggs very useful in recipes where other ingredients need to be held together, e.g. vegetables in a quiche flan, a breadcrumb or batter coating on the outside of some fried chicken or fish, the combining of ingredients for a fish cake or burger. Mechanically whisking egg protein causes the protein molecules to stretch and trap air bubbles, particularly when egg white protein is whisked to make meringue. This makes eggs a useful raising agent, e.g. in the mechanical whisking of eggs and sugar together to make a sponge cake that rises due to trapped air bubbles. Adding an acid to protein (e.g. adding lemon juice to cream or milk), causes denaturation and coagulation, which thickens the cream or milk.</i></p> <p><i>If meat or fish is cooked for too long or at too high a temperature, the coagulation of denatured proteins continues to the point where they tighten and squeeze out any water they were holding. The result is less nutritionally valuable due to the development of a solid, unpleasant and dry texture, which is difficult to chew, digest and absorb in the body. In scrambled eggs, overcooking/overheating results in lumps of rubbery-textured egg in a watery liquid.</i></p>
<p>b) Starch (6 marks)</p>	<p>Answer should include reference to the following with details and examples:</p> <ul style="list-style-type: none"> <li>● Glucose molecules and composition of starch</li> <li>● Starch granules – effects of moist heat</li> <li>● Gelatinisation</li> <li>● Gel formation.</li> </ul>

Chapter 7 Section A (short-answer questions)

1. Explain what the following terms mean:	
a) Aerobic respiration (2 marks)	<i>The release of energy from food during respiration that involves the use of oxygen.</i>
b) Metabolism (2 marks)	<i>The many complex and interconnected biochemical reactions that take place continuously in the body.</i>
c) Basal Metabolic Rate (2 marks)	<i>The minimum amount of energy needed by the body to stay alive and keep all the major organs functioning whilst the body is warm and at rest.</i>

2. List four sources of energy for the body (4 marks)	
	Any of the following: <ul style="list-style-type: none"> <li>● Glucose</li> <li>● Galactose</li> <li>● Fructose</li> <li>● Free fatty acids</li> <li>● Amino acids</li> <li>● Glycerol</li> <li>● Lactic acid</li> <li>● Acetate</li> <li>● Alcohol (ethanol)</li> </ul>

3. Describe the functions of the following nutrients in energy release in the body:	
a) Iron (2 marks)	Answer should include reference to the following: Haem; haemoglobin; oxyhaemoglobin; erythrocytes; oxygen release into body cells; mitochondria.
b) Protein (2 marks)	Answer should include reference to the following: Globin; haemoglobin; iron; oxyhaemoglobin; erythrocytes.
c) Glucose (2 marks)	Answer should include reference to the following: Mitochondria; general formula for the release of energy from glucose; ATP.
d) Phosphorus (2 marks)	Answer should include reference to the following: ATP; respiration; release of energy from ATP.  <i>The mineral phosphorus is needed to make a substance called adenosine tri phosphate (ATP). ATP captures the chemical energy that is released from glucose during aerobic respiration and delivers it to provide energy for other processes in the cells:</i>  $C_6H_{12}O_6 + 6O_2 \longrightarrow 6H_2O + 6CO_2 + 36ATP$ <p style="text-align: center;">                     Glucose + oxygen                      water + carbon dioxide + adenosine triphosphate (ATP)  <span style="display: block; text-align: right;">(ENERGY)</span> </p> <i>The energy is released from ATP when the bonds between the three phosphate atoms (especially the bonds at the end of the ATP molecule) are broken by hydrolysis.</i>

4. Describe the role of iodine in regulating metabolism. (2 marks)	
The answer should include reference to the following: Hypothalamus; pituitary gland; thyroid stimulating hormone; thyroid gland; thyroid hormones T3 (triiodothyronine) and T4 (thyroxine); amino acid tyrosine.	<i>The mineral iodine forms part of two thyroid hormones that are involved in metabolism.</i>  <i>Metabolism refers to the thousands of complex and interconnected biochemical reactions that constantly take place in the body. These metabolic reactions support and maintain all the systems and functions of the body and are regulated by hormones and enzymes.</i>  <i>Regulation of metabolism begins in the brain, in the hypothalamus. One of its functions is to send a hormone to the pituitary gland in the brain, to instruct it to produce thyroid stimulating hormone (TSH). This hormone stimulates the thyroid gland in the neck to produce two thyroid hormones – T3 (triiodothyronine) and T4 (thyroxine). These hormones travel around the body in the bloodstream and regulate energy production from oxygen and glucose in every cell in the body. The cells of the thyroid gland absorb the mineral iodine and join it to the amino acid, tyrosine, which together make T3 and T4.</i>

## Section B (extended-answer questions)

1. Explain, in detail, why it is essential that a human embryo/foetus, infant and young child all receive a sufficient supply of the following nutrients:

a) Vitamin A (4 marks)

Answer should include reference to the following:

Retinol, beta carotene; retinoic acid; epithelia cells in blood vessels, glands and organs; embryonic and foetal development/cell differentiation; immune system development, child growth.

*From the moment of conception, human body growth and development begins and continues into adulthood. Physical growth involves a complex set of processes in the body that result in an increase in the number and size of body cells, tissues, organs, height and mass. None of these processes and developments within the body can take place without a continuous supply of energy and materials, i.e. nutrients.*

*Vitamin A (retinol) is essential at all stages of growth and development for various reasons. Retinol is converted in the body to retinoic acid, which is an important growth substance for epithelial cells that line the cavities and surfaces of blood vessels and are found in glands and organs throughout the body.*

*Retinol and retinoic acid are both essential for embryonic development; particularly for cell differentiation where cells change from one type to another and become specialised, e.g. into nerve cells, mucosal cells, muscle cells. It happens during the development of the embryo and foetus during pregnancy, and also during childhood and into adulthood.*

*Vitamin A is also needed for the development and correct working of the immune system and how it responds to infections. In particular, it is needed for the production of the mucous membranes that line various parts of the body, e.g. the digestive system, bronchial tubes, and reproductive organs. These membranes are needed to help the immune system prevent infections from invading the body, thus enabling it to grow and develop normally during the early years of life.*

b) Vitamin D (4 marks)

Answer should include reference to the following:

1,25-dihydroxycholecalciferol, calcium; calcium binding protein; skeletal development; hydroxylapatite; osteoblasts; osteoclasts; immune system; formation of red blood cells.

c) Lipids (4 marks)

Answer should include reference to the following:

Triglycerides, phospholipids and cholesterol and normal growth and development in human infants; essential fatty acids (omega 6 linoleic acid, omega 3 alpha-linolenic acid and docosahexaenoic acid (DHA)) and brain, retina and cell membrane development; absorption of fat-soluble vitamins A, D, E and K.

2. Explain, using examples to illustrate your answer, the role of anabolic and catabolic reactions in regulating metabolism in the body. (10 marks)

Answer should include reference to the following, with detailed examples including chemical reactions:

Definitions of anabolic and catabolic reactions; protein synthesis; digestion; protein deamination; energy production.

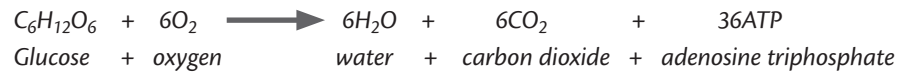
*There are two main types of metabolic reactions – anabolic and catabolic.*

*Anabolic reactions make large molecules from smaller ones and there are many examples in the body, including:*

*Protein synthesis (production) is an example of an anabolic reaction, which is under the control of hormones and the availability of amino acids and energy. In the human body, the process of protein synthesis takes place in all cells, where new protein molecules are formed from amino acids that have been obtained from proteins in the diet. During digestion, dietary proteins are broken down (catabolism), resulting in the production of free amino acids, some of which are then reorganised through a series of chemical reactions into non-essential amino acids that the body needs, e.g. methionine is converted into cysteine; phenylalanine is converted into tyrosine.*

Other examples of anabolic reactions include making hormones, e.g. growth and reproductive hormones and insulin; producing the disaccharide lactose from galactose and glucose for breast milk and making triglycerides from fatty acids and glycerol.

Catabolic reactions break large molecules down into smaller ones, usually by hydrolysis reactions such as those that happen when food is digested and in the production of energy:



Protein deamination is an example of a catabolic reaction. Proteins contain nitrogen, and too much of it is toxic to the body. In order to get rid of excess nitrogen, the amino acids are deaminated in the liver by having their nitrogen removed as  $\text{NH}_3$  (ammonia). The ammonia is combined with carbon dioxide to form urea (which is an anabolic reaction) and it then travels in the blood to the kidneys to form urine, which is excreted. The remaining parts of the amino acids are used for energy production.

2. Explain, using examples to illustrate your answer, the role of anabolic and catabolic reactions in regulating metabolism in the body. (10 marks)

Answer should include detailed reference to the following, with explanations and examples:

Definition of BMR; variations include:

- Age
- Body size and composition
- Body temperature
- Diet/fasting
- External body temperature
- Gender
- Glands
- Heredity
- Mental state
- Body organs
- Percentage body fat
- Physical activity level
- Pregnancy
- Surface area of body
- Thermic effect of food

## Chapter 8 Section A (short-answer questions)

1. Explain what is meant by an obesogenic environment. (1 mark)

*Factors in the environment in which people live that influence the incidence and prevalence of obesity in a population, e.g. availability of energy-dense foods, the number of fast-food outlets, eating culture, advertising.*

2. Explain why the accumulation of visceral fat puts a person's health at risk. (2 marks)

*Upper-body obesity / visceral fat are linked to the development of NCDs such as heart disease, high blood pressure (hypertension), stroke (cerebrovascular accident [CVA]), insulin resistance and Type 2 diabetes, and a variety of cancers.*

3. Identify and explain three risk factors for obesity. (3 marks)

Any of the following:

- Excess consumption of energy-dense foods
- Lack of physical activity / sedentary behaviour
- Mindless eating and drinking
- Consumption of sugar-sweetened drinks
- Unhealthy family eating habits in childhood
- Possible genetic predisposition to a higher body mass index
- Parental obesity
- Living and working in an obesogenic environment
- Overeating due to high levels of stress, anxiety and/or depression.

4. What is an atheroma and how is it involved in the development of CHD? (4 marks)

*Atheroma are fatty substances that are deposited in the walls of the coronary arteries and severely restrict (and eventually block) the flow of blood, depriving the cardiac muscle of oxygen (and therefore energy), which causes it to stop working properly. This is called atherosclerosis.*

5. Explain why low-density lipoproteins (LDLs) are known as 'bad cholesterol'. (2 marks)

*Excess amounts of cholesterol in the body can lead to CVD. After being produced in the liver, cholesterol is carried around the bloodstream attached to lipoproteins. Low-density lipoproteins (LDLs) transport cholesterol to body cells, but do not take excess amounts back to the liver for disposal. Instead, the excess cholesterol is deposited in the artery walls and forms atheroma, which predisposes someone to developing CVD, so LDLs are known as bad cholesterol.*

6. Why is having chronic hypertension detrimental to a person's health? (2 marks)

*Chronic hypertension gradually damages major organs such as the kidneys, liver, brain and the eyes without an individual being aware – often referred to as the 'silent killer'. Someone who has persistent high blood pressure is at greater risk of developing CVD, especially heart attack and stroke.*

7. Identify and explain three risk factors for hypertension. (3 marks)

Any of the following with explanations:

- Increasing age
- Being overweight or obese
- High intake of sodium/salt – adults should have no more than 6g salt a day
- Unbalanced diet
- Family history of hypertension
- Lack of physical activity
- Sedentary behaviour
- High intake of alcohol or caffeine
- Smoking
- Lack of sleep
- Chronic stress.

8. In Type 2 diabetes, explain what insulin resistance means. (2 marks)

*For energy production to take place, receptors and insulin are required to allow glucose to enter body cells. In Type 2 diabetes, the pancreas either does not produce enough insulin or there are not enough receptors in the body's cells, so the insulin cannot let glucose in to release energy. The cells have become resistant to insulin, which causes hyperglycaemia.*

9. Describe three health complications of diabetes. (3 marks)

Any of the following:

- Damage to nerves and blood vessels – diabetic neuropathy
- Ulcerated feet, leading to gangrene
- Arteriosclerosis (fat deposits in artery walls)
- Retinopathy leading to blurred vision and blindness
- Glaucoma leading to blindness
- Kidney disease
- Cardiovascular disease – heart disease, stroke, high blood pressure.

10. Explain two ways in which dental disease can be prevented. (2 marks)

Any of the following:

- Limited and infrequent intake of free sugars and processed carbohydrates
- Avoidance of acidic foods, e.g. concentrated fruit juices
- Avoid giving babies and young children sweet foods and drinks so that they do not develop a preference for sweet flavours
- Avoid build-up of dental plaque by frequent cleaning of teeth with fluoride toothpaste
- Regular dental inspection of teeth.

11. Explain why research shows that eating plenty of fruit and vegetables helps to reduce the risk of developing certain cancers. (2 marks)

*Fruit and vegetables provide dietary fibre, which protects against gastro-intestinal cancers.*

*Research suggests that antioxidants (including vitamins A, C and E) in fruits and vegetables help to prevent damage to body cells by free radicals.*

*Some phytochemicals in plant foods may also protect cells from cell damage and the risk of developing certain cancers.*

12. Explain three factors that can help reduce the risk of developing cancer. (3 marks)

Any of the following with explanations:

- Following a physically active lifestyle
- Achieving and maintaining a healthy body weight
- Eating a healthy, balanced diet
- Limiting alcohol intake
- Not smoking tobacco
- Getting plenty of sleep and rest
- Avoiding or limiting exposure to stress
- Avoiding exposure to known harmful substances and carcinogens.

13. List four risk factors for developing diverticular disease. (4 marks)

Any of the following:

- A low fibre diet
- Chronic constipation
- Not drinking enough water each day
- A diet low in fruits, vegetables and wholegrain cereals
- Not being physically active.



14. Explain why someone with iron deficiency anaemia will experience these symptoms: fatigue, weakness and lack of energy. (3 marks)

*Iron is required for the formation of haemoglobin, which is found in red blood cells (erythrocytes), and is required to carry oxygen around the bloodstream to all body cells. The oxygen is used during respiration to produce energy.*

*A deficiency of iron leads to anaemia, because the body cannot produce enough energy for its needs through respiration. Therefore some of the symptoms of anaemia will be fatigue, weakness and lack of energy.*

15. What causes megaloblastic anaemia? (1 mark)

*A deficiency of either vitamin B<sub>12</sub> or folate.*

16. Explain three ways in which you could encourage children to consume more dietary fibre and prevent constipation. (3 marks)

*Encourage consumption of fruits, vegetables and whole grain foods, e.g.:*

- Smoothies
- Soups
- Add finely chopped vegetables to casseroles and sauces.

## **Section B (extended-answer questions)**

1. Explain the aetiology of coronary heart disease. (8 marks)

Answer should include detailed reference to the following, with explanations and examples:

- Heart muscle requirements for oxygen
- Coronary arteries
- Cause and development of atheroma/angina/atherosclerosis
- Formation of blood clots/coronary thrombosis
- Heart attack/myocardial infarction/cardiac arrest.

*The heart needs a steady supply of oxygen-rich blood, which flows through the coronary arteries to supply the cardiac (heart) muscle with oxygen, so that energy can be released from glucose to keep the muscle working constantly, in order to pump blood around the body. In CHD, this blood supply becomes blocked or interrupted by fatty substances called atheroma that become deposited in the walls of the coronary arteries and severely restrict and eventually block the flow of blood. This prevents the cardiac muscle from receiving enough oxygen and therefore energy, which causes it to stop working properly. As the artery begins to become blocked and the blood flow is restricted, a condition known as angina will develop, which causes a pain in the chest, which comes on intermittently; especially when the heart has to work harder, e.g. to walk up a slope.*

*The atheroma can rupture, which will cause a blood clot called a coronary thrombosis, to form and block the supply of blood to the cardiac muscle, leading to a heart attack. This is a serious medical emergency because if the patient does not receive rapid medical treatment, the heart muscles will be irreversibly damaged. If a large enough amount of the heart muscle is damaged, the heart may stop beating (cardiac arrest), which is likely to lead to death. The symptoms of a heart attack are usually a crushing chest pain, pain in the jaw, neck, arms (often the left arm) and the back; breathlessness; a feeling of weakness and being light headed; feeling anxious. Sometimes the pain is only mild and may be mistaken for something else, e.g. indigestion.*

2. Explain how certain eating habits, lifestyle and the environment can lead to a person becoming obese. (8 marks)

Answer should include detailed reference to the following, with explanations and examples:

- Portion sizes of meals
- Consumption of energy-dense drinks and alcoholic beverages with meals
- Consumption of energy-dense ready meals, processed and fast foods
- Eating foods out of the home
- Consumption of large volumes of alcohol and/or sweet carbonated and energy drinks, fruit juices and other soft drinks that contain high levels of sugar
- Eating food between meals/snacking and grazing
- Time of day when food is eaten
- 'Mindless' eating
- Living and working in an obesogenic environment
- Sedentary lifestyle.

<p>3. a) Explain why chronic hypertension is often referred to as the 'silent killer'. (3 marks)</p> <p>b) Explain the relationship between excess salt intake and hypertension. (3 marks)</p>	<p>Answer should include reference to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>● Lack of symptoms</li> <li>● Damage to major organs</li> <li>● Risk of developing other health conditions.</li> </ul> <p>Answer should include reference to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>● Function of kidneys</li> <li>● Sodium/potassium balance</li> <li>● Blood pressure and damage to arteries</li> </ul> <p><i>The job of the kidneys is to filter the blood and remove excess water from it in order to maintain the balance of fluids in the body. The water is made into urine and excreted. The removal of water in this way needs the correct balance of sodium and potassium. Eating excess salt (sodium chloride) in foods increases the risk of kidney and other organ failure. This is because an excess blood sodium level, disrupts the sodium-potassium balance required by the kidneys and puts them under severe strain. Also, the blood pressure increases because the extra sodium in the blood causes more water to be retained, which means there is a greater volume of blood for the heart to pump around the body and the fragile blood vessels in the kidneys become damaged, which can eventually lead to kidney failure.</i></p> <p><i>Arteries have tiny muscles in their walls so they can expand and contract as required by the body. When under extra strain, due to hypertension as a result of increased salt intake, the muscles become thicker and stronger. This makes the interior diameter of the arteries narrower and further increases the blood pressure, as the heart has to work even harder in order to be able to pump the blood around the body through smaller arteries. The arteries could eventually burst or become blocked, resulting in other body organs being permanently damaged.</i></p>
<p>4. Describe and explain two ways in which diverticular disease can be prevented. (4 marks)</p>	<p>Answer should include reference to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>● Structure and role of the colon</li> <li>● Cause and role of constipation in development of diverticular disease</li> <li>● Importance of water, dietary fibre and physical exercise in its prevention.</li> </ul>
<p>5. Explain the aetiology of iron deficiency anaemia. (8 marks)</p>	<p>Answer should include reference to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>● Structure and role of haemoglobin and erythrocytes</li> <li>● Energy production (respiration)</li> <li>● Dietary sources of iron, role of vitamin C</li> <li>● Importance of iron stores in the body</li> <li>● Causes and effects of symptoms of anaemia.</li> </ul>

**Section C (case study)**

<p>A patient has been referred to a dietitian with chronic hypertension. The dietitian has identified that the patient eats a lot of ready meals and takeaway foods, fried snack foods, cheeses, smoked meats and fish, processed meat products and sauces such as soy sauce. The patient also adds salt to their food at most meal times.</p> <p>a) Develop a fact sheet that the dietitian could use to help the patient to understand:</p> <ul style="list-style-type: none"> <li>● The importance to their health of lowering their salt intake.</li> <li>● How to identify which foods contain high levels of salt.</li> <li>● How to use alternative flavours to produce appetising foods. (10 marks)</li> </ul> <p>b) Prepare a recipe booklet that includes a range of dishes that have low salt levels that the patient could try. (8 marks)</p> <p>c) Prepare and cook some of these dishes and set up a tasting panel to evaluate and comment on the results. (12 marks)</p>	<p>Written part of answer should include:</p> <p>a) Information, with details and examples about:</p> <ul style="list-style-type: none"> <li>● The effects of chronic hypertension on short- and long-term health</li> <li>● How to read food labels to identify sodium/salt levels in a range of foods</li> <li>● Comparison of the salt content of different foods</li> <li>● A range of alternative flavours to salt.</li> </ul> <p>b) The salt content per portion/100g in each recipe.</p>
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## Chapter 9 Section A (short-answer questions)

1. List three factors that influence the nutritional needs and food intake of individuals. (3 marks)

Any of the following:

- Age and life stage
- Gender
- State of health
- Lifestyle
- Levels of physical activity.

2. What is a food desert? (1 mark)

*A food desert is an area of the country (often low-income, inner city areas) where healthy, nutrient-dense foods are not readily available, and where there is a disproportionately high number of convenience stores, fast food and takeaway outlets.*

3. Describe the features of a healthy food environment. (2 marks)

*Healthy food environments are areas that provide fair and equal access to healthy foods, such as fresh and pre-prepared fruit, vegetables and whole foods, in outlets and organisations that also run food production programmes, community kitchens, cooking classes, food growing and food distribution schemes to encourage and support healthy eating.*

4. What are Dietary Reference Values (DRVs) used for? (2 marks)

*Dietary Reference Values are standards that have been set of the amounts of different nutrients that different groups of people in a population need, and ensuring that the recommendations given are suitable for the majority of healthy people. They are used to assess the nutritional suitability of the diets of different population groups and as a source of information about food composition for the general population.*

5. What does Reference Nutrient Intake (RNI) mean? (1 mark)

*The amount of a nutrient that is sufficient (or more than sufficient) for the needs of 97.5% of people in a population of healthy people.*

6. Explain why the following nutrients are important in adolescence:

a) Iron. (1 mark)

*To prevent iron deficiency anaemia, especially in adolescent girls who are menstruating.*

b) Calcium and vitamin D. (1 mark)

*Adolescence is a critical time for skeletal development, and calcium and vitamin D are needed to enable the bones of the skeleton (and teeth) to mineralise properly so that they eventually reach peak bone mass. Approximately 90% of peak bone mass is reached by eighteen years of age in females and twenty years in males.*

7. Why is folic acid an important nutrient in the first stage of pregnancy? (1 mark)

*Folic acid is the synthetic version of folate (vitamin B<sub>9</sub>) that is given as a supplement in pregnancy. It is involved in the metabolism of DNA and rapid cell division and growth of the embryo and foetus. A sufficient intake reduces the risk of the development of neural tube defects (e.g. spina bifida), which can occur in the developing embryo between twenty-one and twenty-eight days after conception.*

8. Why is an intake of zinc important in pregnancy? (1 mark)

*Zinc is needed for the metabolism of DNA and RNA, and a deficiency during pregnancy may lead to growth retardation, birth complications and defects in the baby.*

9. Suggest five reasons why some elderly people may become malnourished when living in a residential home. (5 marks)

Any of the following:

- An undiagnosed, underlying health condition or illness that is contributing to malnutrition
- Inadequate numbers of staff to help residents with feeding
- Inadequate monitoring of residents' food and liquid intake, weight loss, etc.
- Depression and loneliness
- Unfamiliar foods being served at mealtimes
- Uninteresting, bland, unappetising, poorly / over cooked and carelessly served food
- Lack of fresh foods served; mostly processed convenience foods provided
- Foods served with inappropriate textures, e.g. too sloppy / soft, too hard / crisp, too chewy
- Inflexible meal times
- No choice of portion size
- Insufficient availability of nourishing drinks and snacks throughout the day and evening.

10. How can the acceleration of macular degeneration in the eye in elderly people be slowed? (1 mark)

*By eating foods containing antioxidant vitamins (A, C, E) in fruits and vegetables, in particular dark green leafy vegetables (which also contain the antioxidants lutein and zeaxanthin), which are beneficial to the health of the eyes.*

11. List two basic nutritional needs for athletes. (2 marks)

Any of the following:

Sufficient energy and nutrients to meet the growth and development needs of younger athletes  
Sufficient energy to meet the basic needs of the body for all athletes plus the additional requirements of the physical activity involved in the sport they play

To provide the nutrients needed in the form of food rather than supplements

To develop healthy eating habits, i.e.:

- A regular meal pattern that fits in with training requirements – at least three meals a day
- The consumption of healthy snacks in between meals to help maintain energy requirements.

12. Describe what 'hitting the wall' means in athletics. (2 marks)

*'Hitting the wall' means an athlete running out of energy (from glycogen) and experiencing severe muscle fatigue. Glycogen stores become depleted after 60–90 minutes of moderately intense exercise and need to be replaced. Once glycogen becomes depleted, the body has to mobilise its fat stores to release fat to be converted into glucose by gluconeogenesis, but this is a much slower process.*

13. How may plant stanols and sterols lower the cholesterol level in the blood? (2 marks)

*Plant stanols and sterols have a similar molecular structure to cholesterol. When they travel through the GI tract, they compete with cholesterol and prevent some of it from being absorbed, so it leaves the body in the faeces. This lowers the total cholesterol and LDL cholesterol levels in the blood.*

14. What does nutrition transition mean? (2 marks)

*Nutrition transition is a major change in the food consumption habits and nutrient intake of a group of people as they experience a gradual transition from a traditional diet of locally grown food that is high in plant foods, fibre and cereals, to a 'Western' diet consisting of a high intake of animal foods (meat, dairy foods), sugars and fats.*

**Section B (extended-answer questions)**

<p>1. Explain how an obesogenic environment can have a negative effect on the nutritional needs and health of a community. (6 marks)</p>	<p>Answer should include detailed reference to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>● Define obesogenic environment.</li> <li>● The types of food that tend to be sold in these environments.</li> <li>● The types of foods (and therefore nutrients) that are not so readily available in these environments.</li> <li>● Effects of local food culture on eating habits/portion sizes/snacking/grazing/ready meals/fast food.</li> <li>● High incidence of overweight and obesity.</li> </ul>
<p>2. Describe and explain the nutritional needs of children aged 6–12 years. (6 marks)</p>	<p>Answer should include detailed reference to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>● Why good nutrition and eating habits are vital for children in this age group.</li> <li>● Vulnerability of children to effects of malnutrition (both under and over-nutrition).</li> <li>● Importance of regular well-balanced meals and water consumption – details on specific nutrients should be given.</li> </ul>
<p>3. Explain the importance of reaching peak bone mass in adulthood, and why healthy eating habits in adolescence are important for this and other reasons. (8 marks)</p>	<p>Answer should include detailed reference to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>● Definition of peak bone mass.</li> <li>● Composition of bones and how they develop.</li> <li>● How much peak bone mass is acquired in adolescence.</li> <li>● Effects of ageing on peak bone mass.</li> <li>● Importance of overall healthy balanced diet.</li> </ul>
<p>4. Explain, with reasons, the nutrient and dietary recommendations for the following medical conditions:</p>	
<p>a) Hypercholesterolaemia. (3 marks)</p>	<p>Answer should include detailed reference to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>● Fat intake</li> <li>● Processed foods</li> <li>● Plant foods.</li> </ul> <p><i>Hypercholesterolaemia means too much cholesterol in the blood, in particular the cholesterol being carried by low density lipoproteins (LDLs), which cause the excess cholesterol to be deposited in the artery walls and form atheroma. If a blood test shows that an adult has over 3mmol/L of LDLs or a total cholesterol level of over 5mmol/L, then they have hypercholesterolaemia and are at risk of developing cardiovascular disease, especially coronary heart disease (CHD).</i></p> <p><i>The nutrient and dietary recommendations for someone with this condition are:</i></p> <p><i>A healthy, balanced diet that is high in plant foods (vegetables, fruits, wholegrain cereals) and low in saturated fats. Cholesterol is produced in the liver from the fats eaten in food; in particular, those fats that contain higher levels of saturated fatty acids, such as full fat dairy products, fat in meat and poultry, lard, coconut oil and processed meat products such as cold meats, sausages and pies. By reducing saturated fats in the diet and eating vegetables and fruit that are naturally low in fat, this will prevent too much cholesterol being produced. Also, many plant foods, e.g. cereal grains, vegetables, legumes (peas, beans, and lentils), nuts, seeds, oils and fruits contain natural phytochemicals called stanols and sterols. They have a similar molecular structure to cholesterol. When they travel through the gastrointestinal tract, they compete with cholesterol and prevent some of it from being absorbed, so it leaves the body in the faeces. This lowers the total cholesterol and LDL cholesterol levels in the blood.</i></p>
<p>b) Hypertension. (3 marks)</p>	<p>Answer should include detailed reference to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>● Overall diet</li> <li>● Salt intake</li> <li>● Processed foods</li> <li>● Plant foods.</li> </ul>

5. Explain how food culture is a major determining factor in what we choose to eat. (8 marks)

Answer should include detailed reference to a range of the following factors, with explanations and examples:

- Definition of food culture
- Food choice
- Where food is eaten
- How food is prepared and eaten
- Number of meals in a day and size of portions
- 'Good' and 'bad' values assigned to different foods, food choices and cooking practices
- Socialisation and eating habits
- Parental example
- Advertising
- Cultural and religious restrictions on food choices
- Regional foods
- Beliefs
- Global food production
- Nutrition transition.

### **Section C (case study)**

A football team (it can be either a women's or men's team), has appointed a dietitian and chef to be responsible for the planning and production of dietary advice and meals for the team during a forthcoming six-week tournament to take place in eight regions of southern Europe during the early summer.

- Produce an information document that will be given to each team member, manager and coaches outlining dietary advice for the duration of the tour. (14 marks)
- Plan and produce a menu for a week's worth of meals and snacks that takes account of different cultural and dietary needs in the team members. (20 marks)
- Provide a nutritional analysis of the menu on one of the days and explain how it meets the nutritional needs of the footballers. (10 marks)

Written part of answer should include:

a) Information, with details and examples about:

- The interaction of nutrients in the body.
- The need to consider the diet as a whole.
- The importance and effects of food and (especially) water intake on performance and overall health.
- How to ensure that energy and hydration needs are met during the tour.
- The effects of good (and bad) nutrition on recovery after a match and/or injury.
- The importance of quality sleep in allowing the body to carry out repairs and rest.

**Chapter 10 Section A (short-answer questions)**

1. Explain what the word diet means. (1 mark)

*The range of foods and drinks a person usually consumes each day.*

2. Give three factors that influence children's eating patterns. (3 marks)

Any of the following:

- Time available, cooking skills, cooking facilities, and/or motivation to prepare family meals in the home.
- Parental knowledge and understanding of nutrition and health.
- Family ethnicity and influence of food culture on food choices and eating patterns.
- Whether or not families eat together at the same time and away from television, social media, digital technologies and other forms of computer-based entertainment.
- Whether families eat their food in or out of the home.
- Parental example and attitude towards food and meals, their own eating patterns and their food choices.
- Availability and accessibility of foods.
- Amount of household income available to buy food.
- Size of food portions – children may eat more when larger portions are presented to them.

3. Using the example of millennials, identify three ways in which this group influences eating patterns. (3 marks)

Any of the following:

- Often eat out of the home.
- Like to eat 'on the go' and want easy-to-eat, healthy snacks.
- Eat fewer regular meals – snacks consumed by this group are nearly equal to the number of meal occasions that people have.
- Prefer to eat 'real', locally sourced, healthy, nutrient-dense, minimally processed fresh foods.
- Many are adopting a new generation of eating patterns, e.g. plant-based/vegan diets; new sources of protein, e.g. insects; 'free from' diets; food combination diets.
- Use all types of social media and digital technologies to choose, review and give feedback on food choices.
- Want to book and use services through a mobile phone or other device at their own convenience.
- Like to use on-demand delivery of food (either ready-made or from a supermarket).
- Use social media to take photos of foods to share with and recommend to friends.
- Want to use local, environmentally and sustainably produced and sourced services and products, that have been produced with ethical working practices.
- Expect to be able to access high quality and contemporary products and services.
- Want exciting, well-designed, user-friendly spaces with technology, in which to meet and socialise with friends.

4. What is the intended purpose of government-produced dietary guidelines? (1 mark)

*To convey a consistent message to the public about healthy eating.*

5. Why are dietary guidelines usually presented as a visual model? (1 mark)

*To attract attention and present the information in an accessible format, so that everyone can benefit from the messages conveyed.*

6. List three of the UK dietary guidelines. (3 marks)

Any of the following:

- Base 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 – no more than 6g (1 level teaspoon) a day for adults.
- Get active and be a healthy weight.
- Do not get thirsty – drink plenty of water.
- Do not skip breakfast.

7. What is meant by a sustainable diet? (1 mark)

*A diet that is ecologically friendly, has a low environmental impact and aims to protect and respect a range of criteria in the food system, including biodiversity, water, soil and air quality, the climate, etc.*

8. List three criteria in the food system that sustainable diets aim to protect and respect. (3 marks)

Any of the following:

- Biodiversity (varieties of plants and animals).
- The environment – water, soil and air quality, plant and animal life and species survival, ecosystems (oceans, forests, north and south poles, rivers, prairies, etc.).
- The climate.
- Food culture and heritage.
- People’s skills: e.g. agricultural, cooking, resource management (land, water, energy, soil).
- Production of locally grown (low food miles), seasonal foods.
- Fair trading arrangements for food producers.
- Fair distribution of food, food security and access to healthy diets.

### Section B (extended-answer questions)

1. Explain why food choices, eating patterns and the composition of meals affects the quality of the whole diet of an individual, and are important for explaining the impact of diet on health and the development of NCDs. (8 marks)

Answer should include detailed reference to the following, with explanations and examples:

- Factors that influence food choices and eating patterns, e.g. food culture, social and physical environment, religious dietary restrictions, parental influence, nutrition transition, etc.
- Composition of meals, e.g. quality and variety of food that is available /affordable; nutritional profile and bioactive compounds in foods; fresh/processed; home cooked/out of the home, etc.
- Impact of food choices, eating habits, food quality and variety, dietary guidelines, and different types of diet on short- and long-term health and the development of NCDs

2. Explain the reasons why the following dietary guidelines are recommended by government and health professionals: (2 marks each)

a) Base meals on starchy foods

Answers should refer to the following, with explanations and examples:

- Energy requirements, production and release into bloodstream
- Wholegrain foods
- Satiety value

b) Cut down on sugar

Answers should refer to the following, with explanations and examples:

- Free sugars
- Dietary and health implications
- Link with NCDs

c) Do not skip breakfast

Answers should refer to the following, with explanations and examples:

- Replacing nutrients in the body at the start of the day
- Effects on the ability to function and concentrate
- Effects on blood sugar levels

3. Analyse a vegan diet for its fitness for purpose in relation to: (3 marks each)

a) Its nutritional profile

Answers should refer to the following, with explanations and examples:

- Macro and micronutrients, especially protein, vitamin B<sub>12</sub>, iron, calcium
- Phytochemicals



A vegan diet excludes all foods of animal origin and promotes whole food, plant-based food choices. Scientific evidence shows that plant foods can provide all the nutrients required by the body, in sufficient amounts when a wide variety are eaten on a daily basis. For example, all the essential amino acids will be provided by eating a mixture of low biological value proteins that are found in many plant foods. There may be some people who will need a vitamin B<sub>12</sub> supplement, as the way in which many plant foods are grown may mean they have limited amounts of this vitamin. Iron from plant sources (e.g. wholemeal bread, green leafy vegetables, dried apricots and lentils) is called non-haem iron. Vitamin C is particularly important for the absorption of non-haem iron, which is affected by various factors in food, e.g. phytates (in cereals and pulses), dietary fibre, tannins (in tea and coffee) and calcium, which can bind onto non-haem iron and reduce its absorption. Calcium can be bound to phytates in wholegrain cereals, pulses and nuts, or oxalates in some vegetables. It needs vitamin D to ensure that as much as possible is absorbed. People who stay indoors for most of the time, especially in northern climates may also need a vitamin D supplement.

Plant foods also supply a wide range of phytochemicals which are known to promote good health and help prevent certain diseases such as cancer.

<p>b) How it compares to dietary guidelines.</p>	<p>Answers should refer to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>• Foods it does and does not include</li> </ul> <p>A vegan diet is based on the consumption of all types of unprocessed vegetables and fruits and whole grain foods. It excludes meat, poultry, fish, dairy foods and eggs, and highly refined foods such as plant oils, white flour, sugar, white rice, foods with added fat and sugar. Foods within the yellow and green segments, and only the legumes/pulses and nuts in the pink segment of the Eatwell Guide model are eaten.</p>
<p>c) How it influences body weight maintenance.</p>	<p>Answers should refer to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>• Nutrient, dietary fibre and energy density – effects on body weight</li> <li>• Importance of these for children</li> </ul> <p>People who are overweight are very likely to lose weight as many plant foods have a low energy density and their fibre content makes many people feel full more quickly and eat smaller portions. Their general health often improves, e.g. blood glucose and cholesterol levels will normalise, and they will have a reduced risk of developing a range of diet-related diseases.</p> <p>It is important that vegan children have a sufficiently energy-dense diet as a high intake of dietary fibre may make them feel full and decrease their energy intake.</p>
<p>d) How far it satisfies personal needs in terms of hunger/satiety, eating patterns and avoiding monotony.</p>	<p>Answers should refer to the following, with explanations and examples:</p> <ul style="list-style-type: none"> <li>• Wide variety of foods available and preparation and cooking methods</li> <li>• Dietary fibre and satiety level</li> <li>• Suitable snack foods</li> </ul> <p>The large variety of plant foods, their wide range of flavours and the numerous methods of preparing, cooking and serving them will avoid monotony. The fibre content can increase satiety and help a person feel full for longer. Plants foods can be eaten in every meal and provide healthy snack foods in between meals if required.</p>

### Section C (case study)

After a lengthy period of poor health and weight loss, a 22-year-old female patient has been diagnosed as having coeliac disease and has been referred to a specialist dietitian for dietary advice and monitoring.

- a) Develop a fact sheet that the dietitian could use to help the patient to understand:
- The nature of their health condition and its implications for their long-term health if it is treated properly.
  - How to identify which foods contain gluten and which foods are safe for them to eat. (14 marks)
- b) Prepare a recipe booklet that shows the patient how to produce appetising meals using gluten-free foods and includes a range of dishes that the patient could try. Include a nutrient profile for a few of the recipes to show how her nutritional needs will be met. (10 marks)
- c) Prepare and cook some of these dishes and set up a tasting panel to evaluate and comment on the results. (12 marks)

Written part of answer should include:

- a) Information, with details and examples about:
- The aetiology of coeliac disease.
  - The potential effects on their body of untreated coeliac disease and the risks of malnutrition.
  - The need to consider the diet and body as a whole.
  - How to treat the disease and prevent it from causing further damage to the body.
  - Identification of foods that can and should not be eaten.