Government of **Western Australia**
School Curriculum and Standards Authority

FOOD SCIENCE AND TECHNOLOGY

ATAR course examination 2016

Marking Key

Marking keys are an explicit statement about what the examining panel expect of candidates when they respond to particular examination items. They help ensure a consistent interpretation of the criteria that guide the awarding of marks.

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Section One: Multiple-choice **15% (15 Marks)**

Question	Answer
1	b
2	c
3	c
4	a
5	d
6	d
7	c
8	a
9	b
10	a
11	b
12	d
13	c
14	d
15	b

Section Two: Short answer **55% (74 Marks)**

Question 16 **(9 marks)**

Describe **three** adaptations to the commodities used in the recipe that would improve the nutritional value of the lasagne. State how **each** adaptation improves nutritional value.

Description	Marks
Three marks for each adaptation:	
Describes the adaptation	2
Identifies the adaptation	1
States how each adaptation improves nutritional value	1
Total	**9**

Answers may include, but are not limited to the following:

Adaptations	Nutritional value improvement
substitute lean minced beef for minced beef	reduces the fat content
increase the number of tomatoes and leave out the stock	reduces salt content
spread a small amount of the meat sauce in the base of the baking dish **or** spray with oil rather than grease with butter	reduces fat content
reduce the amount of mince and replace with grated vegetables such as carrot **or** zucchini	increases fibre **or** micronutrients
replace the cheese sauce with a layer of ricotta cheese	reduces kilojoules **or** fat
replace grated cheese topping with parmesan cheese	reduces fat content
omit salt from cheese sauce as cheese contains salt **or** replace with mustard	reduces salt content
use wholemeal rather than white lasagne sheets	increases fibre content
add chopped parsley or basil for flavour rather than salt and pepper	reduces salt content
substitute an unsaturated lipid for butter	reduces saturated fat content

Question 17 (10 marks)

(a) Identify **two** trends related to the consumption of soft drink products. Propose **one** cause for each trend. (4 marks)

Description	Marks
Two marks for each trend:	
Identifies the trend	1
Proposes a cause for the trend	1
Total	**4**

Answers may include, but are not limited to the following:

Trends	Cause
• males over the age of 9 consume more soft drinks than females of the same age	• this age group is gaining more independence in food choices • females maybe more concerned about body image or weight gain
• females over the age of 9 consume less soft drink than males of the same age	• peer group pressure
• 50% of 14–18 year old males consume soft drink	• success of marketing to the age group
• youths and young adults consume more soft drink than other age groups	• convenience of product, e.g. vending machines or • cost is less than bottled water
• males aged 14–18 have the highest consumption of soft drinks	• make their own food choices when eating away from home
• female consumption is highest in the 14–18 age group	• can afford to purchase food independently of their parents

(b) Explain **three** impacts on health associated with excessive sugar consumption. (6 marks)

Description	Marks
Two marks for each impact:	
Explains the impact on health	2
Identifies the impact on health	1
Total	**6**

Answers may include, but are not limited to the following:

• higher sweetened drink consumption may result in drinking less water • that can contribute to weight gain
• consumption of soft drinks can increase dental caries • due to the sticky sugar remaining on the teeth for prolonged periods
• sweetened foods can suppress the appetite • may reduce the consumption of more nutritious foods
• soft drinks have a kilojoule content • if not balanced with energy output may lead to weight gain
• high sugar consumption • may contribute to the onset of Type 2 diabetes

Question 18 (6 marks)

Describe the purpose of **each** of the natural food components in the Master Pizza Dough.

Description	**Marks**
Two marks for each natural food component:	
Describes the purpose of the natural food component	2
States the purpose of the natural food component	1
Total	**6**
Answers may include, but are not limited to the following:	

Natural food component	**Purpose**
Gluten (bread flour)	• the strands intertwine and give the dough the ability to stretch • allows air to be enclosed during kneading
	• the strands intertwine to allow the dough to stretch and change shape • allows carbon dioxide to be trapped during fermentation
	• a firm structure is formed that holds its shape when cooked • gluten coagulates during baking
Sugar	• has a tenderising effect on dough by absorbing liquid and preventing the uptake of water by flour • retards gluten development **or** prevents dryness **or** produces a finer crumb
	• increases softness in freshly baked dough and extends shelf life • sugar helps to retain moisture due to its water attracting ability
	• maillard reaction occurs when sugar **or** starch and protein from milk are present and dry heat is applied during baking • produces a golden crust on dough and improves flavour
	• when moisture evaporates and sugars crystallise • assists in formation of crisp crust
	• sugar acts as an activator for yeast during fermentation • sugar is needed to speed up the production of carbon dioxide that causes leavening
Oil	• inhibits gluten formation • creating a softer texture or mouth feel • results in a pizza dough that does not rise as high

Question 19 (8 marks)

Identify **two** food processing techniques that can be used to control the performance of fish. Explain how and why each technique controls the performance of fish. Provide **one** example of a food product made using each technique.

Description	Marks
Four marks for each processing technique:	
Identifies a food processing technique that can be used to control the performance of fish	1
Explains how and why the process occurs when each technique is applied	2
States how or why the process occurs when each technique is applied	1
Provides one example of a food product made using each technique	1
Total	**8**

Answers may include, but are not limited to the following:

Food processing technique	Explanation	Food product
Application of heat	• denatures the protein molecules so a permanent structural change takes place • coagulation occurs and sets the protein	Fish: • grilled • fried • poached • baked
	• physical changes occur in the flesh • the flesh changes to a semi-solid **or** solid form	
	• changes the sensory properties of fish • connective tissue or collagen becomes tender	
Addition of acid (vinegar, lemon juice or wine)	• causes denaturation • tenderisation occurs due to the change in the structure of protein molecules	Ceviche Fish Tartare
	• causes the flesh to change from semi-solid to solid • causes flesh to be tenderised	
	• flesh changes colour • coagulation can occur more quickly at a lower temperature	
Manipulation or Mechanical action (cutting, mincing or slicing)	• causes the softening of the flesh • connective tissue is broken down causing softening of the flesh	Sashimi Ceviche Fish Tartare Fish balls or patties

Question 20 (8 marks)

Provide **two** health benefits of consuming each of the functional food products listed.

Description	**Marks**
Two marks for each functional food product:	
Provides two health benefits of consuming the functional food product	2
Provides one health benefit of consuming the functional food product	1
Total	**8**

Answers may include, but are not limited to the following:

Functional food product	**Health benefit**
Yoghurt	Probiotic yoghurt: • suitable for people who suffer lactose intolerance as the cultures break down the lactose in the milk from which traditional yoghurt is produced • produces lactic acid which can inhibit the growth of pathogenic bacteria and thus prevent some viruses from multiplying in the intestine • leads to a reduction in serum cholesterol levels by absorbing cholesterol **or** facilitating its excretion from the body • enhances nutrient absorption from the bowel **or** protects the bowel against some cancers **or** other major bowel disorders Prebiotic yoghurt: • prebiotics enhance the growth of bacteria which contribute to well being • prebiotic bacteria can improve digestion **or** enhance mineral absorption **or** increase the effectiveness of the immune system.
Margarine with plant sterols	• inhibit the absorption of cholesterol through the small intestine • help cholesterol pass through the body rather than being absorbed in the blood stream • lowers cholesterol absorption • assist in lowering LDL **or** low-density lipoprotein cholesterol levels
Bread with Omega 3	• reduces formation of blood clots • helps to correct impaired blood vessel function • aids development of the central nervous system in babies before birth • assists brain functions to relieve depression **or** reduce memory loss associated with ageing
Milk with calcium enrichment	• assists to reduce the risk of osteoporosis **or** rickets • aid bone development **or** function • aids the formation of teeth • if vitamin D is added, assists in absorption of calcium • aids nerve **or** muscle formation

Question 21 (11 marks)

(a) Define the term 'biotechnology' and state why it is used in food systems. (2 marks)

Description	Marks
Defines the term biotechnology	1
States why it is used in food systems	1
Total	**2**
Answers may include, but are not limited to the following:	
• biotechnology is the use of microorganisms in food production systems • used for the production of new food products	
• biotechnology is the use of biological processes • that are used to change the properties of foods to create new products	
• biotechnology is the use of organisms such as cells or bacteria • used to develop **or** make new products	

(b) Describe **three** ways in which biotechnology is applied in food systems. Provide **one** example of a food product made using each application of biotechnology. (9 marks)

Description	Marks
Three marks for each application of biotechnology:	
Describes an application of biotechnology in food systems	2
Identifies an application of biotechnology in food systems	1
Provides an example of a food product made using the application of biotechnology	1
Total	**9**

Answers may include, but are not limited to the following:

Application of biotechnology	Food product examples
The use of microorganisms **or** moulds **or** bacteria can change the physical or sensory properties of food	Moulds: • blue **or** soft ripened **or** camembert **or** brie cheese • ripening on the surface of sausages • soy sauce Bacteria: • vinegar • cheese **or** yoghurt **or** sour cream • chocolate • probiotics
The use of yeasts - causes fermentation	• bread **or** sourdough bread • cheese • wine **or** beer • yeast extracts used for savoury flavours in snack foods **or** spreads
The use of genetic modification – changes the characteristics of food products	• golden rice • canola • drought **or** weed **or** insect resistant crops

Question 22 (12 marks)

Identify **three** phytochemicals, provide a food source for each and describe a role that each has in promoting health.

Description	Marks
Four marks for each phytochemical:	
Identifies a phytochemical	1
Identifies a food source of the phytochemical	1
Describes a role in promoting health	2
Identifies a role in promoting health	1
Total	**12**

Answers may include, but are not limited to the following:

Phytochemical	Food source	Role in promoting health
Phytoestrogens	tofu, tempeh, miso, soy products	• these have similar functions and chemical properties to the human hormone oestrogen • they play a role in the prevention of chronic diseases such as heart disease **or** prevention of osteoporosis **or** lowering cholesterol levels **or** reducing the symptoms of menopause **or** reducing hormone related cancers such as breast **or** prostate cancer
Antioxidants	berries, wholegrain cereals, tea, red wine, many fruits and vegetables	• complement body defense systems, have a role in postponing or preventing heart disease **or** cancer **or** arthritis **or** ageing • play a role in preventing damage to body cells by acting as a scavenger of free radicals
Probiotics	fermented milk drinks, kefir, tempeh, soy sauce, sauerkraut, salami	• are live health promoting bacterial cultures • are believed to aid in gastro-intestinal disorders, such as constipation **or** inflammatory bowel disease **or** diarrhoea
Prebiotics	asparagus, lentils, chick peas, onions, beans	• are non-digestible fibre compounds that pass through the upper part of the digestive tract • they stimulate the growth of beneficial bacteria found in the large intestine

Question 23 (10 marks)

(a) Identify **two** health conditions due to the inability of the body to absorb, digest or metabolise nutrients. Explain the cause of each condition. (6 marks)

Description	Marks
Three marks for each health condition:	
Identifies health condition	1
Explains the cause of each condition is caused	2
States how or why each condition is caused	1
Total	**6**

Answers may include, but are not limited to the following:

Health condition	Explanation
Diabetes	• caused by the inability of the pancreas **or** body to produce sufficient insulin to metabolise glucose • glucose cannot enter the cells without insulin and remains in the bloodstream causing elevated blood sugar levels
Coeliac	• caused by an inability of the body to absorb gluten the immune system reacts to unabsorbed gluten • the villi in the small intestine are damaged making them unable to absorb gluten
Lactose intolerance	• caused by insufficient amounts of the enzyme lactase which is essential for the absorption of lactose • unabsorbed lactose reaches the colon and produces the symptoms of lactose intolerance

(b) Describe a dietary approach that can be used to manage **two** health conditions caused by the inability of the body to absorb, digest or metabolise nutrients. (4 marks)

Description	Marks
Two marks for each health condition:	
Describes a dietary approach that can be used to manage the condition	2
States a dietary approach that can be used to manage the condition	1
Total	**4**

Answers may include, but are not limited to the following:

Health condition	Description
Diabetes	• reduce the intake of carbohydrates high in starch • these cause a rapid rise in blood sugar levels
	• increase intake of low GI foods • these food release glucose slowly into the bloodstream
Coeliac	• eliminate intake of food products that contain wheat **or** barley **or** rye • these foods contain gluten
	• consume gluten free food products • eliminates gluten consumption
Lactose intolerance	• limit the amount of dairy food consumed at any one time • reduces the amount of lactose consumed
	• choose lactose free/reduced food products • limits the amount of lactose consumed

Section Three: Extended answer **30% (40 Marks)**

Question 24 **(20 marks)**

(a) Describe **two** consequences of food inequity. (4 marks)

Description	Marks
Two marks for each consequence:	
Describes clearly the consequence	2
States a fact about the consequence	1
Total	**4**

Answers may include, but are not limited to the following:

Consequence	Description
Under-nutrition	• food inequity can result in inadequate intake of nutritious food • this can cause malnutrition which is associated with disease and premature death
	• food inequity can result in inadequate intake of nutritious food • this can cause an inadequate intake of vitamins and minerals which are essential for good health
	• the world population and food supply is unevenly distributed • the highest agricultural production is not in the areas of highest population density leading to food inequity
Over-nutrition	• wealth enables people to consume far more kilojoules than are required for good health • this poor nutritional intake can result in obesity and chronic disease
	• as countries become more developed traditional diets high in fruits, vegetables and cereals are supplemented with meat and dairy products • high consumption of salt, sugar and fat are typical of over-nutrition that leads to chronic disease
	• wealthier countries spend a small portion of income on food • this usually includes a high proportion of animal fats and sugars which lead to chronic disease
Political instability	• famine causes migration to areas where food may not be available • when food is not available the population puts pressure on governments **or** relief agencies for food
	• rising food prices caused by natural disasters, political decisions or crop failures leads to food inequity that results in violence and unrest • this causes political instability when populations pressure governments for relief
	• conflicts over the control of land occur when there is political instability • this threatens food production and food security

Question 24 (continued)

(b) Describe how the production of biofuels and the demand for meat and dairy foods affect the global food supply. (4 marks)

Description	Marks
Two marks for each issue:	
Describes the effect on the issue	2
Provides a brief statement about the effect on the issue	1
Total	**4**

Answers may include, but are not limited to the following:

Issue	Effect on global food supply
Production of biofuels	• there is an increased demand for biofuels which use grain in their production • this reduces the supply of grain available for food
	• commercial companies that produce biofuels purchase large amounts of land on which to grow crops for fuel • this reduces the land available for crops for food production
	• the use of grain for the production of biofuels raises the price of staple foods • this makes staple foods more expensive and less available to low income populations
	• the price of grain for human consumption will increase due to its use for biofuel production • this will increase the price of meat, poultry and eggs that rely on grain for feed and impact negatively on food security
Demand for meat and dairy foods	• grain products can be produced relatively cheaply compared to livestock • the grain used as feed for livestock would be better used to feed humans as it is more nutritious than meat
	• raising of livestock requires large amounts of land • many more people can be fed from a given area of land producing grain rather than livestock
	• intensive production of meat, eggs and milk is more environmentally demanding than agricultural production • damage to the soil and waterways impacts on the availability of land to produce crops and reduces yield
	• production of livestock requires significant amounts of water for the animals and fertilisers to produce grain for feed • use of these resources for this purpose is unsustainable as they could be better used to increase agricultural production for human food supply

(c) Explain the influences each of the following factors has on the development of new food products. Identify a food product developed in response to each factor:

- changing demographics
- population growth
- technology
- convenience. (12 marks)

Description	Marks
Three marks for each factor:	
Explains the influence the factor has on the development of new food products	2
Provides a brief statement about how food product development is influenced	1
Identifies a food product developed in response to the factor	1
Total	**12**

Answers may include, but are not limited to the following:

Factor	Influence	Food product
Changing demographics	• increase in the aged population will influence product developers, groups such as the baby boomers are generally affluent and a significant potential market • they choose premium products and consider issues surrounding food production such as health **or** sustainability **or** packaging	Any one of: • value added products • fortified products • modified products
	• an increase in people living alone such as the elderly and young people • leads to an increase in the production of single serve meals and home replacement meals	Any one of: • easily opened products • tamper proof products • single serve juices
	• younger people are concerned about body image **or** independence, they work irregular hours and tend to eat snacks and small informal meals • they purchase single serve meals, take-away food and pre-prepared meals	Any one of: • single serve products • low fat, sugar and salt products • frozen meals
Population growth	• more food is required to feed an increasing global population • technologies such as GM, intensive farming and the use of fertilisers increase crop yields	Any one of: • GM rice • GM soya beans • organic foods
	• population growth due to immigration and refugee movement • requires food producers to develop culturally appropriate food products	Any one of: • halal products • culturally specific products, e.g. chick peas, seaweed, etc.
	• an increase in the numbers of people knowledgeable about the links between food intake and health • has led to producers using improved processing techniques that retain nutrition or improve packaging or that clarify labelling	Any one of: • preserved products • canned products • frozen products

Question 24(c) (continued)

Factor	Influence	Food product
Technology	• food processing systems that reduce food spoilage without the use of heat or additives • the products retain sensory **or** nutritive properties **or** shelf life is increased	Any one of: • fruit juices • low fat milk • omega 3 enriched products • iron enriched products
	• increased consumer awareness of the environmental impacts of food packaging • has led to the development of biodegradable **or** re-sealable packaging	Any one of: • grated cheese • frozen berries • PET bottles
	• increased consumer focus on food safety • has led to the development of secure packaging **or** safe storage systems	Any one of: • tamper proof packaging • refrigerated storage systems • single serve food pouches
Convenience	• consumers are increasingly time poor and seek convenient ways to feed themselves • food producers have responded with a wide range of convenience **or** pre-prepared **or** preserved **or** take-away foods that are nutritious and fresh	Any one of: • take-away salad bars • canned foods • frozen meals • light and easy • dinner twist
	• consumers are less familiar with food preparation skills • they use pre-prepared products to make meals	Any one of : • canned foods • pre-prepared sauces • pre-prepared meat products
	• consumers who are concerned with health will purchase products they believe have nutritional benefits • this saves them time as they can increase nutritive intake without effort	Any one of: • fortified products • modified products • value-added products

Question 25 (20 marks)

(a) State the purpose of the Recommended Daily Intakes (RDI). Outline **three** ways in which the RDI may be used. (4 marks)

Description	Marks
States the purpose of the RDI	1
One mark for each outline in which the RDI may be used. Maximum three marks	1–3
Total	**4**
Answers may include, but are not limited to the following:	
Purpose	
• Provide the average daily dietary intake level that is sufficient to meet the nutrient requirements of the majority of healthy individuals at a particular life stage and gender group. **or** • The RDI are intended as a guide for compiling diets from basic foods. When the diet is designed to contain the nutrients listed, it is likely to contain all the other factors necessary for health.	
Way in which RDI may be used	
• as a guide to planning menus for individuals and groups • for first assessment of the adequacy of the diet of a group of individuals • as a guide for nutrition labelling • for monitoring the availability of nutrients in the national food supply • as a guide to planning diets for specific medical purposes	

Question 25 (continued)

(b) Identify **one** macronutrient and **one** micronutrient that are required in larger quantities during adolescence. Describe the benefit of each nutrient to adolescent health. (6 marks)

Description	Marks
Identifies one macronutrient that is required in large quantities during adolescence	1
Identifies one micronutrient that is required in larger quantities during adolescence	1
For each of the two nutrients identified:	
Describes in detail the benefit to adolescent health	2
States the benefit to adolescent health	1
Total	**6**

Answers may include, but are not limited to the following:

Nutrient	Health benefit
Protein (macro)	• is necessary during the adolescent growth phase • is needed for the building and repair of hard and soft body tissues, i.e. bone **or** teeth **or** muscles **or** organs
	• essential to the production of enzymes **or** antibodies **or** hormones **or** haemoglobin • during the adolescent growth phase
	• is necessary during the adolescent growth phase • to assist in building body tissue mass
	• a secondary source of energy • when there are insufficient lipids consumed to meet energy output
Carbohydrates (macro)	• sources of energy • are needed for the structure and function of cells, tissues and organs
Calcium (micro)	• calcium is needed for bone growth **or** strength • for the formation of teeth **or** reducing the development of rickets
	• calcium is needed in larger amounts for muscle contraction • as it triggers the reaction with regulatory proteins
	• prevention of osteoporosis in adolescents who avoid calcium products • due to dieting **or** allergies **or** intolerance to lactose
Iron (micro)	• is essential for the increased production of enzymes **or** antibodies **or** hormones **or** haemoglobin • to guarantee adequate supply during the adolescent growth phase
	• for the formation of haemoglobin in the blood • due to the increase in blood volume **or** muscle mass due to the adolescent growth phase
	• the onset of menstruation in adolescent females causes loss of iron • which must be replaced to reduce the incidence of anaemia

(c) Provide **two** reasons why people consume micronutrient supplements. Explain **two** advantages and **two** disadvantages of the consumption of micronutrient supplements.
(10 marks)

Description	**Marks**
Provides two reasons why people consume micronutrient supplements. One mark for each reason	1–2
Two marks for each advantage and two marks for each disadvantage. Maximum eight marks.	
Explains an advantage of the consumption of micronutrient supplements	2
States an advantage of the consumption of micronutrient supplements	1
Explains a disadvantage of the consumption of micronutrient supplements	2
States a disadvantage of the consumption of micronutrient supplements	1
Total	**10**

Answers may include, but are not limited to the following:

Reasons

- individuals who require more nutrients at particular stages of the life cycle such as adolescence **or** pregnancy **or** lactation **or** the elderly **or** disabled **or** for the treatment of chronic disease
- individuals who require more nutrients because of lifestyle choice such as vegetarianism **or** drug addiction **or** alcoholism **or** health fanaticism
- individuals who live in remote areas and lack a supply of fresh food
- individuals who have differing nutritional requirements due to conditions such as allergies **or** intolerances

Advantages	**Disadvantages**
• may benefit a person whose diet is restricted and lacks variety due to socioeconomic restrictions • supplements may be a more economical solution to providing essential micronutrients to individuals in low socioeconomic situations	• consumption of excess water soluble vitamins and minerals may be a waste of money • water soluble vitamins and minerals are eliminated when consumed in excess
• location • supplements will provide micronutrients to those who lack access to fresh fruit **or** vegetables	• adequate micronutrients can be consumed from a balanced diet • supplements are an unnecessary expense
• those with allergies or intolerances • will lack some essential micronutrients **or** B group vitamins **or** calcium **or** iron • consumption of supplements can compensate for this	• when taken in excess **or** in undesirable combinations • can interfere with prescribed medications
• lifestyle choices such as vegetarianism may cause a lack of protein **or** calcium **or** iron **or** folate • supplements can compensate for this	• some vitamins or minerals are toxic when consumed in excess • self-medication with supplements may result in excessive consumption **or** • fat soluble vitamins can be toxic when stored in the body

Question 26 (20 marks)

(a) Identify the type of product development represented in the illustration. Provide **three** advantages of this type of food product development. (4 marks)

Description	Marks
Identifies the type of product development as line extension	1
One mark for each advantage of line extension. Maximum three marks	1–3
Total	**4**
Answers may include, but are not limited to the following:	
• increases brand recognition and consumers are more likely to try the product • expands company shelf space in the supermarkets and allows for increased presence of products • gains greater market share as customers try different product sizes **o**r flavours • increases product variety • increases market efficiency as retailers are able to display a range of products together • increases profits for the producer.	

(b) Describe **one** implication of the production of the new version of this product on each of the following:

- the consumer
- the original manufacturer
- the competitor. (6 marks)

Description		Marks
Two marks for each aspect:		
Describes fully an implication		2
States an implication		1
Total		**6**
Answers may include, but are not limited to the following:		
Aspect	**Implication**	
Consumer	• increased product range available • consumers can compare the products for value **or** nutrition	
	• ability to purchase product at a cheaper price due to competition • increases money available for purchasing other products	
	• competitor trademark may not be recognised • due to minimal brand **or** product promotion **or** similarity to the original	
Original manufacturer	• competition can lead to decreased market share • resulting in sales reduction **or** less profit	
	• competition may lead to increased product promotion **or** price alteration • appeal to consumer to maintain market share **or** profits	
Competitor	• save money on product research • able to sell product at same **or** a cheaper price	
	• viable to produce • existing product meets consumer needs and already accepted	
	• use ‘me too’ product to enter into a growing market • can increase market share **or** develop trademark awareness	

(c) Identify t**wo** current developments in food packaging and explain how each extends the shelf life of food products. (10 marks)

Description	Marks
Identifies two current developments in food packaging that extend shelf life. One mark for each development	1–2
Four marks for each development in food packaging. Maximum eight marks.	
Explains in detail how the development in food packaging extends shelf life	4
Outlines how the development in food packaging extends shelf life	3
States briefly how the development in food packaging extends shelf life	2
States a fact about food packaging and extended shelf life	1
Total	**10**

Answers may include, but are not limited to the following:

Current developments	How the development extends shelf life of food products
Aseptic packaging system	• independently sterilises both food and packaging then fills the package and seals the product in a sterile environment • extends shelf life without the use of preservatives **or** food additives **or** use of refrigeration
	• packaging consists of layers that act as a barrier to light and oxygen and eliminate the need for cold **or** preservatives • maintains natural colour **or** flavour **or** nutrient value **or** sensory properties
Modified atmosphere packaging system **or** MAP	• modifies the environment inside food container to extend the shelf life by protecting it from microbial **or** chemical contamination **or** oxygen **or** water vapour **or** light that lead to food spoilage • air space around the food is altered to maintain sensory **or** nutritional properties **or** maximise shelf life
Barrier Specific	• packaging material admits some gases at different rates and excludes others • extends shelf life by allowing fresh produce to respire without the formation of water droplets inside the packaging film that cause mould
Vacuum	• removes air to create a vacuum around the food before sealing • prevents oxidation and makes it difficult for bacteria **or** mould to grow
Gas Flushing	• alters the atmosphere inside package by adjusting levels of oxygen and carbon dioxide controlling ripening **or** mould growth • nitrogen added to replace oxygen keeps sealed bag inflated to protect product from damage
Active packaging	• uses active packaging film **or** small pouches of reactive material to remove **or** add gases to headspace of package **or** to absorb odours produced by fresh meat **or** poultry products to extend shelf life • oxygen scavengers absorb oxygen and prevent mould **or** ethylene scavengers trap ethylene produced by ripening fruit **or** vegetables to reduce rotting
Intelligent packaging	• changing conditions within the packaging show on a colour guide on the package label • informs consumer of the level of freshness or quality of the contents
	• tamper-proof packaging aims to create packaging that irreversibly changes colour when the light or gas mix in the package alters • this alerts the consumer to the possibility of tampering or the possibility of contamination

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