

GCE

Home Economics (Food, Nutrition and Health)

Advanced GCE

Unit G004: Nutrition and Food Production

Mark Scheme for January 2011

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Se	ction	Α				
C	uest	ion	Expected Answers	Marks	Rationale	
1	(a)	(i)	 State two reasons why food packaging is important. Two marks are available. One mark for stating each reason. Protection of the food product for contamination barrier to oxygen, water vapour, air and dust Protection against bacterial contamination Protection from damage (does not get squashed) Make the product look attractive to the consumer and can be used to encourage sales and reinforce brand image. Product information on the packaging informs the consumer about the food product e.g. label communicates how to use, store and prepare the product. Convenience can be added for both retailer and consumer e.g. display, storage, use and reuse of the product. Packaging which specifies the number of portions gives convenience and can reduce wastage e.g. bulk packaged or single serving of the product. Security as packaging can ensure the product is safe e.g. tamper proof jars and seals. Increase shelf life 	[2]	Accept 2 different types of information	
1	(a)	(ii)	Describe two advantages to a food manufacturer of using glass as a packaging material. Two marks are available. One mark for describing each advantage. It will not transfer any microbiological or chemical contamination. Lasts longer/longer shelf life for manufacturer Food product will not react with the glass/glass inert Glass can be moulded into a wide variety of shapes Easily cleaned and sterilised by a food manufacturer.	[2]		

Question	Expected Answers	Marks	Rationale
	 Glass provides an excellent moisture and gas barrier and does not affect the taste of the food inside. Food processed at high temperatures can be hot filled directly into glass containers, saving manufacturing time and ensuring a high quality product is produced. Consumer can see the product this may increase sales. Cheap form of packaging to produce, allowing food products stored in glass to remain competitive in price. Some premium products are associated with heavy glass packaging by consumers, for example, spirits and champagne. Manufacturers can contribute to concerns about the environment as glass is easy to recycle. In the UK there is an extensive recycling infrastructure. 		
(a) (iii)	 Describe two disadvantages to a food manufacturer of using glass as a packaging material, Two marks are available. One mark for describing each disadvantage. Glass is vulnerable to breakage. Manufacturers may suffer some profit loss due to breakages. Difficult to store/stack Safety issues associated with the broken packaging during food production. Mixed and dark/coloured glass is difficult to recycle adding extra cost to production. Glass is difficult to print on and requires labels at extra cost. Food manufacturers may be concerned about the carbon footprint. There is an environmental impact as the mining of glass sand results in emissions and soil erosion. Manufacturing glass is high energy consuming due to high temperature required for processing the raw materials 	[2]	

	ction		Francis d Amorros	Mauka	Detionals
1	(b)	(i)	Identify two different dietary sources of iron. Two marks are available. One mark for identifying each different source. • apricots, blackcurrants, raisins, beans (including baked beans), lentils, pulses, broccoli, peas, cabbage, spinach, watercress, eggs, lean red meat, liver, kidney, liquorice, chocolate, pulses any oily fish, nuts, wholegrain cereals and wholemeal bread.	Marks [2]	Rationale Do not accept 'bread' or 'meat' alone Generic terms cannot be accepted with specific examples but credit the generic term on its own eg Pulses and lentils is 1 mark. Lentils and beans 2 marks
1	(b)	(ii)	 State two different dietary functions of iron. Two marks are available. One mark for stating each function. Iron is needed for the formation of haemoglobin in red blood cells, which Important in the transport of oxygen from the lungs to body tissues. Iron is required to avoid anaemia. Iron is required for normal energy metabolism and excretion. It plays an essential role in the production of the body's white blood cells/immune system. 	[2]	

Sec	tion A			
Qı	uestion	Expected Answers	Marks	Rationale
1	(c)	Identify and explain two factors which may affect an individual's energy requirement.	[4]	
		One mark is available for each correctly identified factor. One mark for an explanation of how the factor may affect energy consumption.		
		 Rate of growth/Age/Stage of life Young children have higher relative metabolic rates than adults. They require more energy in relation to their size than adults. This is because they are generally more active and are growing rapidly. With increasing age energy requirements decrease. This is partly due to a reduction in physical activity and a reduction in lean body mass. 		children need more energy than adults -1 mark children need more energy than adults because this is a period of rapid growth – 2 marks
		 Size/Gender In general the larger the body mass the greater the energy expenditure. Men require more energy than woman because they tend to have a larger overall body size and higher lean to fat ratio than women. The metabolic rate is higher and they tend to use more energy. Activity level/Occupation/Job Sedentary occupations including office workers, drivers, shop workers and those following a sedentary lifestyle require less energy. Moderately active occupations including light industrial workers require more energy. 		
		 Very active occupations e.g. builders' labourers, steel workers require the greatest physical exertion and therefore have the largest energy requirement. 		

Question	Expected Answers	Marks	Rationale
Section A Question	 Athletes who train for long periods of time will require a greater energy intake. State of body Pregnancy: Extra energy is required for the healthy growth and development of the baby. Lactation: the production of breast milk requires extra energy. Illness: the metabolic rate rises during a fever and may decrease due to reduction on physical activity. Weight reduction: to lose weight a person must reduce their energy consumption from food. Body composition: lean body tissue is metabolically more active and uses more energy than adipose tissue. 	Marks	Rationale
	 Hormonal imbalance: overactive thyroid gland can increase the metabolic rate and individuals may need to consume more energy to address the imbalance. Environmental conditions Food plays a role in prevention of hypothermia since it is the primary source of fuel for body heat production. A high-energy intake is required when working or living in extremely cold 		
\ \(\d\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	environments.	[2]	
1 (d) (during the heating of a starch based sauce. Answers may include: 1 mark identifying one behaviour change during the heating. 2 marks identifying a behaviour change and explaining how it affects starch based sauce.	[2]	
	 Starch granules soften when heated with moisture, they absorb water. 		

Se	ction	Α				
G	uest	ion	Expected Answers	Marks	Rationale	
			 The absorption of water causes the liquid to thicken or gelatinise. The sauce will become thicker. Gelatinisation occurs between 75°C and 87°C. The sauce should be boiled for 2 minutes to ensure fully gelatinisation. Amylose and amylopectin molecules bond with each other to form a gel like structure. The sauce will become runny by the addition of an acid e.g. lemon juice. This can prevent the development of starch chains and produce smaller molecules. 		Reference to change in liquid, 1 mark, eg thicken/starch swell Reference to gel formation for 1 additional mark	
1	(d)	(ii)	 State one behaviour change which occurs during the whisking of an egg to produce a foam. 1 mark stating one behaviour change during whisking. Answers may include: The mechanical action of whisking will cause the mixture to thicken/mixture thickens/stiffens. The incorporation of air causes the mixture to become paler. Eggs contain proteins which will stretch when whisked and trap air. The protein structure uncoils and a stable 3D air/liquid structure is formed. 	[1]		
1	(d)	(iii)	Identify one factor which can affect the ability of an egg white to produce a foam. 1 mark identifying one factor. Temperature of egg white/coldness inhibits foam production/warmth promotes foam production. Freshness of egg white. Type of beater used to whisk egg.	[1]		

Section A			
Question	Expected Answers	Marks	Rationale
	 The presence of fat/oil/egg yolk The presence of sugar. The addition of ingredients e.g. tartaric acid/vinegar/pH level. Insufficient whisking time. 		
1 (e)	Risk assessment is used to identify and control hazards in food production. Explain 3 possible hazards and describe the control measures I hazard with explanation linked to storage is 2 marks, 3 required	[6]	
	 Answers may include: Hazards that could be applied to storage Contamination of food with food poisoning bacteria and toxins in the environment. Incorrect storage temperature Cross contamination between raw and cooked food. Food poisoning bacteria present and multiplying in food. Food out of date code. Contamination with chemicals eg pest control Harmful chemicals stored with food products. Spillage of chemicals in storage areas. Chemical residuals left on surfaces after cleaning. Contamination with foreign bodies. Damage to food packaging. Contamination with pests. Raw meat/uncooked food storage 		
	 Control measures that could be applied to storage Store food wrapped or in containers. Wash hands before handling food. Ensure storage equipment and surfaces are clean. 		Do not allow repeats of descriptions of control measures References to temperature must be accurate, do not accept store at correct temperature as a control measure.

Question	Expected Answers	Marks	Rationale
	 Label with correct date code. Rotate stock according to date code. Discard out of date stock. Separate raw and cooked food. Ingredient storage temperatures for frozen -18°C to -25°C. Chilled ingredients should be stored at refrigeration temperatures (at or below 8°C, targeting 5°C) throughout their entire life. Rigorous monitoring of temperatures. Space should be left between goods for air circulation. Staff given clear instructions for stacking and handling ingredients. Temperature control checks of storage equipment and areas should be conducted and regular records kept. Limited periods of time outside the temperature control are permitted for preparation, display or transport provided that the temperature attained by the food poses no risk to food safety. Store cleaning chemicals in a separate area from food products Train staff on correct procedures. Eg wear appropriate headwear/clothing Cover food whilst in storage to prevent foreign bodies entering Cleaning routines of storage areas 	Marks	Do not accept store in fridge on its own

Section B			
Question	Expected Answers	Marks	Rationale
2	Vitamins have important dietary functions. Explain the role of vitamins in the diet.	[25]	
	High 19-25 The candidate demonstrates an accurate knowledge of the role of vitamins in the diet. The explanation will show detailed understanding. The information will be presented in a fluent and well structured manner. Subject specific terminology will be used accurately. There will be few, if any errors of grammar, punctuation and spelling.		
	Middle 13-18 The candidate demonstrates a good knowledge of the role of vitamins in the diet. The explanation will show understanding. The information will be presented clearly and some subject specific terminology will be used. There may be occasional errors of grammar, punctuation and spelling.		
	Middle 7-12 The candidate demonstrates some knowledge of the role of vitamins in the diet. The explanation will show a limited understanding and may lack detail. The information will be presented simply and some subject specific terminology will be used, although not always used appropriately. There will be errors of grammar, punctuation and spelling.		
	Low 0-6 The candidate demonstrates superficial knowledge of the role of vitamins in the diet. They will show very limited understanding. The information will be poorly expressed with little or no use of subject specific terminology. Errors of grammar, punctuation and spelling may be intrusive.		
	Answers may include: Vitamins are a group of nutrients that control important metabolic reactions in the body. Vitamins are substances which are required in small amounts.		

Section B			
Question	Expected Answers	Marks	Rationale
Question	 Vitamins are involved in the formation of hormones, enzymes, proteins, nerves and genetic materials. Most vitamins must be consumed in the diet because the body cannot manufacture them. A deficiency disease is a disease caused by a lack or poor absorption of a nutrient e.g. a vitamin. Vitamin A helps vision, especially in the dark. Retinol is associated with the protection and maintenance of the retina in the eye. Vitamin A is needed for the formation of rhodopsin also known as visual purple. It maintains mucous membranes that line any openings to the body e.g. nose, throat, lungs, mouth, stomach and urinary tract. It helps tissue, bone and skin cell formation. Vitamin A is important for growth and it is essential for embryo development. Both an excess and deficiency of vitamin A are known to cause birth defects and it involved with the maintenance of the immune system. Night blindness is the inability to see well in dim light and is associated with a deficiency of vitamin A. If untreated the condition can lead to blindness. Vitamin D is needed with calcium and phosphorus to develop and maintain bones and teeth. It helps with the healing of fractured bones Vitamin D may prevent brittle bone disease or osteoporosis in later life and helps the absorption of calcium from the intestine. Rickets is a deficiency of vitamin D in babies and toddlers. In adults, a deficiency of vitamin D can lead to an adult version of the disease called osteomalacia. Vitamin D deficiency is more likely to develop in young children, 	Marks	Rationale
	pregnant women and breastfeeding women.People with darker skin are at greater risk of vitamin D		
	deficiencies because increased pigmentation in the skin reduces the ability of the skin to manufacture vitamin D from sunlight.		

Section B Question	Expected Answers	Marks	Rationale
•	Vitamin E is not a single substance but from a family of fat- soluble vitamins. It is stored in the liver and body tissue. Some members of the vitamin E family are called tocopherols. Evidence suggests vitamin E protects body tissue from damage caused by unstable substances called free radicals. Vitamin E is important in the formation of red blood cells and helps the body to use vitamin K. Vitamin K is important in the blood clotting process. Vitamin K is very important for bone health. It can increase bone density and may well prevent osteoporosis. Thiamin is important in the process of energy release. It plays a vital role in helping the body to convert carbohydrates and fat into energy. Thiamin is necessary for the transmission of nerve signals between the brain and the spinal cord. Thiamin is essential for normal growth and development of the body. It helps to maintain proper functioning of the heart, muscle and digestive systems. Thiamin deficiency can lead to beri beri. Riboflavin is essential for releasing energy from food and is vital for growth and development of the body. Riboflavin in involved in the production of red blood cells, hormones, helps to keep skin, eyes, the nervous system and mucous membranes healthy. Niacin is essential in the metabolism of carbohydrates, fats and proteins to produce energy. It maintains a healthy skin, keeps the digestive and nervous system working well. Niacin is essential to the production of hormones including oestrogen and insulin. Deficiency is called pellagra.	Marks	

Question	Expected Answers	Marks	Rationale
	 Vitamin B6 is required for the use and storage of energy from proteins and carbohydrates. It assists with the conversion of the amino acid tryptophan to niacin. Vitamin B12 is used in the metabolism of fats, proteins and carbohydrates for cell growth and the maintenance of the nervous system. Vitamin B12 is needed for the manufacture of red blood cells and supports the immune system. Vitamin B12 deficiency is known as pernicious anaemia. Folic acid is required for the development of the spinal cord in the embryo. Folic acid can reduce the risk of having a baby born with spina bifida. Folic acid is essential for the formation of red blood cells. Vitamin C is required for growth. It is needed to make collagen, an important protein found in skin, ligaments, and the walls of blood vessels. Vitamin C is essential for repair of body tissues including the healing of wounds and development of scar tissue, and required for the repair and maintenance of cartilage, bones, and teeth. It assists in the formation of red blood cells by helping the absorption of iron from the intestines and has a vital role in the immune system and the function of lymphocytes to fight infections. Vitamin C is an antioxidant. It works with vitamin E another antioxidant to block some of the damage caused by free radicals. Credit will be given for all valid points. 	Marks	Rationale

Section B			
Question	Expected Answers	Marks	Rationale
	Explain the processes involved in the design, development and production of new food products. High 19-25 The candidate demonstrates an accurate knowledge of the processes involved in the design, development and production of new food products. The explanation will show detailed understanding. The information will be presented in a fluent and well structured manner. Subject specific terminology will be used accurately. There will be few, if any errors of grammar, punctuation and spelling. Middle 13-18 The candidate demonstrates a good knowledge of the processes involved in the design, development and production of new food products. The explanation will show understanding. The information will be presented clearly and some subject specific terminology will be used. There may be occasional errors of grammar, punctuation and spelling. Middle 7-12 The candidate demonstrates some knowledge of the processes involved in the design, development and production of new food products. The explanation will show a limited understanding and may lack detail. The information will be presented simply and some subject specific terminology will be used, although not always used appropriately. There will be errors of grammar, punctuation and spelling. Low 0-6 The candidate demonstrates superficial knowledge of the processes involved in the design, development and production of new food products. They will show very limited understanding. The information will be poorly expressed with little or no use of subject specific terminology. Errors of grammar, punctuation and spelling may be intrusive.	Marks [25]	Rationale

Section B			
Question	Expected Answers	Marks	Rationale
Question	Answers may include: Identification of gap in the market and evaluation of existing products. Research methods on existing products include the use of questionnaire, survey of competition and disassembly. Qualitative research could be interviews with the target group. Quantitative research involving the study of factual data of consumption patterns and market size. Development of product profile may include details about, type of product, target group, ingredients, nutrition profile, projected shelf life, retail price and packaging. Possibilities explored in the development of a product specification and product prototypes. The use of CAD will be employed to model ideas. Costing and feasibility of ideas explored including the cost of research, raw materials, labour, machinery, and distribution, marketing and advertising. Ideas may be rejected because the procurement of the ingredients and price is too variable. Development of product to include sensory testing and piloting small trials of the product. Scaling up of recipe for large-scale factory production. Calculation of the shelf life. Production of a manufacturing specification. This will provide the manufacturer with accurate information on proportions, ratios and tolerances within the product. The food manufacturing system will be controlled by the HACCP system of risk assessment and safety checks. Quality manuals for the new product may exist. They will cover the physical characteristics of the finished package and the properties of the product itself, like colour, flavour and texture. Individuals who are trained organoleptically and the new product development (NPD) team also may complete daily random tastings.	Marks	Rationale

Section B				
Question	Expected Answers	Marks	Rationale	
Question	 The product quality testing is usually completed off-line, with samples taken at the beginning, middle and end of the batch. Quality control and quality assurance systems will be used to ensure maintenance of a good quality end product. The production of the product maybe large scale and controlled by a CAM system. This is typically a 24-hour batch operation system with the production schedule based on stock-check information, predictive sales data and known sales. The establishment of a distribution system for the product. Refrigerated storage and transportation may be required for a fresh, chilled product. A detailed ingredients list is given to the marketing department so accurate nutritional information can be added to the product label. Ideas for packaging will also be explored and the legal requirements for food labelling followed. There will be consideration of the target market, storage and cost with the development of packaging designs. The importance of pricing the product accurately for the competitive marketplace will be critical for success. Marketing and launch of the product. Various methods maybe used to raise consumer awareness of a new product. This may include special tasting inside the supermarket, money off coupons, trial size samples, preferential shelf positioning, special introductory pricing etc. Credit will be given for all valid points. 	Marks	Rationale	

Section B			
Question	Expected Answers	Marks	Rationale
4	Discuss how to meet the dietary and nutritional needs of babies and children.	[25]	
	High 19-25 The candidate demonstrates an accurate knowledge of the dietary and nutritional needs of babies and children. The discussion will show detailed understanding. The information will be presented in a fluent and well structured manner. Subject specific terminology will be used accurately. There will be few, if any errors of grammar, punctuation and spelling.		
	Middle 13-18 The candidate demonstrates a good knowledge of the dietary and nutritional needs of babies and children. The discussion will show understanding. The information will be presented clearly and some subject specific terminology will be used. There may be occasional errors of grammar, punctuation and spelling.		
	Middle 7-12 The candidate demonstrates some knowledge of the dietary and nutritional needs of babies and children. The discussion will show a limited understanding and may lack detail. The information will be presented simply and some subject specific terminology will be used, although not always used appropriately. There will be errors of grammar, punctuation and spelling.		
	Low 0-6 The candidate demonstrates superficial knowledge of the dietary and nutritional needs of babies and children. They will show very limited understanding. The information will be poorly expressed with little or no use of subject specific terminology. Errors of grammar, punctuation and spelling may be intrusive.		

Section B			
Question	Expected Answers	Marks	Rationale
	Answer may include:		
	Rabias		
	 Babies Babies rely on their mother's milk or formula milk to satisfy their nutritional needs. Babies use iron stores accumulated before birth but these stores are rapidly depleted and it is important that their diet contains enough iron to meet the needs for growth and development. Requirements for protein, the B vitamins and minerals also increase between 6 and 12 months. At 6 months a baby should be gradually introduced to a variety of foods such as infant cereals, rice puddings, yoghurts, pureed fruit and vegetables. Eggs must be cooked and should not be given to babies under 6 months. 		
	 Sugar and salt must not added to foods. Home prepared and cooked food is preferable to commercial baby foods, which may be sweetened or salted. Babies need to be given iron-rich foods when they are weaned 		
	such as fish, minced meat, cereals and eggs.		
	Pre-school children		
	 Energy requirements increase during this time because young children are active and growing rapidly. Protein requirement increases slightly for growth. Increased need for all the vitamins except vitamin D because it will now be synthesised in the skin, with exposure to sunlight. Milk and dairy products remain an important source of calcium and Vitamin D. 		
	Pre-school children should be given whole milk, not skimmed or semi-skimmed. Semi-skimmed milk may be given after the age of 2 years, but skimmed milk should not be given to children under the age of five.		

Question	Expected Answers	Marks	Rationale
	 Sensible patterns of eating should be established at this time, with meals taken at regular times and a wide variety of foods introduced. Avoid nuts if concerned about choking risk. Snacks should consist of carrots, bread, cheese and yoghurt, rather than fatty, salty or sugary foods. Care needs to be taken over the amount of fibre (non-starch polysaccharide or NSP) eaten by young children. A diet that is too bulky could result in a child being unable to eat enough food to satisfy its energy needs. 		
	 School aged young children 4-6 years children Energy requirements increase and there is a greater need for protein, all the vitamins except vitamins C and D, and all the minerals except iron. The requirement for vitamin C remains the same as for preschool children. Asian children may be at risk of vitamin D deficiency because of low vitamin D intake from food and/or inadequate exposure of skin to sunshine. 		
	 7–10 years children There is an increase in requirements for energy and protein. There is no change in the requirement for thiamine, vitamin C or vitamin A; however the requirements for the other vitamins and minerals are increased. School-age children should be eating at least five portions of fruit and vegetables each day. The family is the main influence on eating habits early in life. It is therefore important that the whole family adopts a healthy lifestyle and avoids salty, sugary and fatty foods. Eating sugary foods frequently between meals causes dental decay. 		

Question	Expected Answers	Marks	Rationale
	Snack foods such as cakes, biscuits, crisps, chocolate and sweets are often high in sugar and saturated fat, and low in certain vitamins and minerals, so their consumption should be limited. To achieve a high-energy intake, energy rich foods should be eaten as part of small and frequent meals.		

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