Nutritional Properties of Food Materials

Food materials can be chosen for their nutritional value or contribution to the food product.

Nutrient	Structure	Function	Sources	Deficiency / Too much
Protein	• Protein is made from *amino acids* • Amino acids combine to make muscles, hormones, skin, antibodies, nails, enzymes, cell membranes, haemoglobin • In plant and animal protein there are about 20 different amino acids • The body can make some amino acids (*non essential amino acids*) The other amino acids have to be obtained from the food we eat – these are *essential amino acids* • The human body needs all 20 amino acids • Children need 10 essential amino acids • Adults need 8 essential amino acids <u>Alternative proteins for people who :</u> • want a more varied diet • are health conscious	• For body growth • For body repair • For energy • For maintenance of health	<u>Animal source</u>: Cheese, eggs, fish, meat, milk, gelatine, offal Proteins from animal sources have a High biological value (HBV) as they contain the essential amino acids. <u>Plant Source</u>: Cereals – Wheat, Oats, Pulses, Rice, Beans, Peas, Pulses, Quorn - Mycoprotein, Soya, TVP, Bread, Pasta Protein from most plant sources are of Low Biological Value (LBV) as they are lacking in more than one essential amino acids. Soya beans however are of a High Biological Value It is advisable to eat a variety of these foods to help the body obtain all the essential amino acids. For example; Spaghetti bolognaise, Chicken curry and rice ,Cauliflower cheese, Meat topped pizza, baked potato with baked beans and cheese. Alternative Proteins –**Meat free proteins**	A protein deficiency can cause various problems • Growth slows or stops in children • Liver fails to function • Muscles become weak • Limbs are thin • Tummy is soft and may look distended • Enzymes are not produced so digestive system not functioning properly • KWASHIORKOR is a disease where there is a shortage of protein Too much protein will be converted to energy and if unused will be stored as fat in the body

	and want to eat less animal foods •do not wish to eat animal foods because of moral, religious or ethical beliefs Alternative Proteins are:- •High in protein •Low in fat •Enriched with Vitamins and Minerals **Food combining** Mixing different low biological value proteins to supply all the essential amino acids. Vegetarians, vegans or other limiting diets rely on combining low biological value proteins (LBV) to form proteins of higher value. Examples are: Beans on toast, Hummus with pitta bread Dhal and rice lentil pate with French bread		**Texturised Vegetable Protein (TVP)** is made from soya beans It is an excellent source of protein and fibre and has a long shelf life if stored correctly **TIVALL** is made from Soya & Wheat Proteins with Calcium, Iron & Vitamins A & B. They are low in fat, saturates, salt and contains no cholesterol or artificial preservatives or colours. QUORN is a MYCOPROTEIN which is extracted from a fungus (similar to the mushroom) which is grown in large vats It is not a vegan food as egg white is used as a binder. It is a healthy meat alternative, free from animal fats and cholesterol. It has high biological value protein and dietary fibre. TOFU and BEAN CURD is made from soya beans, water and a coagulant, or curdling agent. The curds are pressed into soft white blocks. It is bland, high in	

			protein and calcium and has the ability to absorb new flavors through spices and marinades. Tofu and bean curd products can be bought frozen. Chilled, ready to cook and eat Ref to video: http://video.about.com/vegetarian/Tofu.htm (How to cook with Tofu with Ben Kurtzman)	

Task: Match the protein type to the correct source using the following words:
Gluten, Connective tissue, Lactalbumin, Milk and cheese, Egg

Protein type	Source
Albumen	
	Milk
Casein	
	Wheat
Collagen	

Task: Alternative proteins can be found in supermarkets.
Complete the table below to show which statements are true or false by placing a tick (√) in the correct column

Statements	True	False
Alternative proteins can be bought in different forms and cooked in many different ways		
Quorn is a mycoprotein and is suitable for vegans		
Tofu can be flavoured with spices, sauces and marinades		
Alternative proteins are usually difficult to store		

Task: Using the words from the list below complete the sentences showing the ethical considerations for alternative proteins.

Controlled environment less Cheaper quicker,

Alternative proteins are ..... and .....to produce than meat and require..... land.

They are made in a..... ..... which helps to keep pollution to a minimum.

Nutrient	Structure	Function	Sources	Deficiency / Too much
Carbohydrates (CHO)	Composed from the elements Carbon, Hydrogen and Oxygen (hydrate because of the same proportion of H and O as in water H2O) Carbohydrates are divided into i. sugars (simple carbohydrates) and ii. starches (complex carbohydrates)	• For energy used for bodily functions • Provide body with energy for physical activity • Sweeten and flavour foods • Provide dietary fibre non-starch polysaccharide (NSP) to help digestion	Usually plant products which has energy obtained from the sunlight with the help of chlorophyll Carbon dioxide + H2O + energy = carbohydrates + oxygen	Too much CHO will be • stored as fat in the body • can lead to weight gain and obesity
Sugars	**Monosaccharides** (simple sugars) Glucose , Fructose (fruit sugar) **Disaccharides** (double sugars) Lactose (glucose and galactose), Sucrose (glucose and fructose)	• Absorbed quickly by the body • Gives instant energy Galactose is formed during digestion of lactose (milk sugar)	Glucose is: • found in fruits, vegetables such as onions, honey • can be manufactured from starch for sweets. • not as sweet as cane sugar and can be added to foods and drinks to increase their energy content but not making them too sweet Fructose is found in fruit, honey, plant juices Sugars are also found in drinks, jam, cakes, biscuits. Glucose is often used by athletes in tablet or powder form to provide a fast –energy boost Lactose: Milk sugar (not as sweet as sucrose), milk Sucrose: Sugar cane and sugar beet, fruit, vegetables	Too much sugar causes: • tooth decay Plaque + sucrose = acid Acid + tooth = decay • obesity

	Maltose A word ending in 'ose' suggests the presence of sugar INTRINSIC sugar: contained within the plant cell wall of fruit and vegetables. Intrinsic sugars are less harmful EXTRINSIC sugars: sugars you can see and added sucrose to products such as cakes, biscuits, sweets		Maltose: Formed from starch in the germination of barley grain. Malt is used in some food production and as a dietary supplement	
Starch	**Polysaccharides** (complex carbohydrate such as starch or fibre) Dextrin (more soluble than starch) Glycogen Cellulose Hemicellulose	Starch must be • broken down into sugars by digestion. • It is a slower process of releasing energy • Adds bulk to the diet Acts as roughage Sets jam (pectin)	Starch comes from plants which store starch such as potatoes, rice, cereals, and pulses. Other sources are pasta, cakes, biscuits, puddings, breakfast cereals. Flour, cornflour **People involved in high endurance sports eat starchy carbohydrates such as pasta** Dextrin comes from starch which has been changed by cooking e.g. toast, breakfast cereals, crusts of loaves Glycogen is an animal carbohydrate Skins of fruit, vegetables, cereals Fruit and vegetables	Too much starch will: • be converted into fat • lead to being over weight and obesity

Non starch polysaccharides NSP	NSP is a type of fibre i. Soluble fibre ii. Insoluble fibre	Soluble fibre • Slows down the absorption of CHO • Helps control blood sugar levels • Stops us feeling hungry • Reduce blood cholesterol levels • Reduce risk of heart disease • Reduce risk of diabetes prevents constipation	Soluble fibre is found in pulses, oats, fruit such as apple, bananas and leafy vegetables, peas, beans, lentils http://www.youtube.com/watch?v=jajYw8G8ZUY **(Good to Know about Dietary Fibre)** http://www.youtube.com/watch?v=QsZML2KQogg (Importance of Dietary Fibre and How Dietary Fibre Works) Insoluble fibre is found in cereal products such as oats, baked beans, wholemeal flour, wholegrain breakfast cereals, pasta, brown rice, some fruit and vegetables	Too little fibre in the diet can cause: • constipation • diverticular disease where the lining of the intestine becomes inflamed

Fact:
If the body takes in more carbohydrates than it needs for its energy use, the unused carbohydrates will be stored as fat in the body. This can lead to obesity.

Task: Design and make lunch for an athlete which is high in carbohydrates.
Use Nutritional software to calculate the percentage carbohydrate in the meal.

Nutrient	Structure	Function	Sources	Deficiency / Too much
Fats	• Composed from the elements Carbon, Hydrogen and Oxygen the same as carbohydrates but in different proportions • The most concentrated energy food • Fats are solid at room temperature • Oils are liquid at room temperature • Fats and oils are made from:- i. *Glycerol* or *glycerine* (sweet sticky liquid) ii. *Fatty acids* (there are about 25 fatty acids) • 1 molecule fat = 1 glycerol + 3 fatty acids • Fatty acids may be saturated or unsaturated • The type of fatty acids present will determine the consistency of the fat or oil:- Lard –soft fat –oleic acid Beef fat – hard fat – palmitic acid	• provide concentrated sources of energy • form part of the structure of cells • help to insulate the body in cold weather. • Excess fat in the diet is stored as body fat • Vital organs such as kidneys are protected by a layer of fat • Fat is a source of fat-soluble vitamins A, D, E, K • Fat gives texture and flavour to foods • We are advised to lower our intake of fat by 35% of our total energy intake Fats helps to give a feeling of being full for longer after eating -*satiety*	Fats come from animal and plant sources Plant sources: fruits such as olives, avocado pears nuts – peanuts, walnuts, pulses seeds – sunflower, soya, sesame Animal sources: Meat and meat products such as lard, suet Dairy products such as milk, butter, cheese, cream Fish particularly oily fish such as tuna, sardines, salmon.	Excess fat in the diet will be • stored as body fat can lead to weight gain and obesity
Saturated fats.	**Saturated fats**. Each carbon atom in the fatty acid is combined with two hydrogen atoms • solid at room temperature • too much saturated fat in the diet		• Animal sources: butter, lard, hard margarine, cheese, whole milk and anything that contains these ingredients, such as cakes, chocolate, biscuits, pies and pastries. It's also the white fat you can see on red meat and underneath poultry skin.	

	is associated with i. high blood cholesterol ii. increased risk of heart disease. iii. diabetes iv. obesity Cholesterol is • produced in the liver • transported round the body by the blood • deposited on the walls of the arteries, narrowing them and making them less efficient	Narrowed arteries: a major cause of heart disease	• Vegetable sources such as coconut and palm oils	
Unsaturated fats Soft or liquid at room temperature	**There are two types:** i. *Monounsaturated* fat: A fat molecule with one hydrogen space	Monosaturated fatty acids can: • Help to lower blood cholesterol • Reduce the risk of diabetes • Be linked with a lower rate of cancer	Monosaturated fatty acids are found in animal and vegetable fats, fish, nuts, olives	
	ii. *Polyunsaturated fats* A fat molecule with more than one hydrogen space They are very soft /oily at room temperature		Vegetable sources: sunflower oil, soya oil, olive oil, sesame oil, mackerel, sardines, pilchards, salmon	
Trans fatty acids	Man-made molecules produced when hydrogen is added to vegetable oils to make them into solid fats This is known as			Trans fatty acids: •raise cholesterol levels •are bad for the cardiovascular system

	hydrogenation.			may increase risk of breast cancer
Essential fatty acids EFAs	*Essential fatty acids*: •cannot be made by the body •are important to the healthy and efficient functioning of the body Two examples of EFAs are • *Omega 3* • *Omega 6*	Essential fatty acids are important for •regulating body processes •blood clotting •controlling inflammation Omega 3 protects the heart Omega 6 helps lower cholesterol	Omega 3 is found in oily fish, seeds, green leafy vegetables, walnut oil Omega 6 is found in fruits, grains, seeds, vegetables, chicken	
Rancid fats	**Hydrolytic fat** caused by the glycerol splitting from the fatty acid **Oxidative fat** :breakdown of fatty acids in reaction with oxygen		Rancid butter	

Facts

- A slice of malt loaf contains 0.7g fat
- A teaspoon of peanut butter contains 5.4g fat
- A jam doughnut contains 10.9g fat
- A handful of mixed nuts contains 21.6g fat
- A pint of whole milk contains 22.8 g fat

Task: Visit your supermarket and conduct a survey of the types of products that have a lower-fat version. Record your findings in the following table.

Product Name	Regular Product	Fat content per 100g	Price	Lower-fat version	Fat content per 100g	Price	How much is the fat reduced per 100g?

Task: Compare the fat content of a range of butter, margarines and spreads.

Name of fat	Product Description	Price	Fat content per 100g

Check food labels

- The nutrition labels are usually on the back on food packaging can help you to cut down on total fat and saturated fat.
- This label will tell you how much fat and saturated fat is contained in 100g of the food
- Some packaging will show nutrition labels on the front, which give at-a-glance information on specific nutrients.
- Packaging may also use traffic lights to show the fat, salt and sugar content, red means 'high'. Beware of eating too many red foods and aim to eat mainly foods that are green or amber.

What counts as high-fat and low-fat?

High fat content	> 20g of fat per 100g	May show a red traffic light
Medium fat content	between3g and 20g of fat per 100g	May show an amber traffic light
Low fat content	3g of fat or less per 100g	May show a green traffic light
High saturated fat	> 5g saturates per 100g	
Low saturated fat	1.5g saturates per 100g	

Facts:

- A food packet with the words “lower fat” or "reduced fat" doesn’t necessarily mean it's a healthy choice.
- The lower-fat claim means that the food is 30% lower in fat than the standard equivalent.
- A high fat food such as mayonnaise is high in fat may still be high in fat with the lower-fat version
- A lower-fat mayonnaise is 30% lower in fat than the standard version, but is still high in fat.
- Foods marked as "lower fat" or "reduced fat" aren't necessarily low in calories.
- Fat is replaced with sugar, and the food may be the same calorie content or even higher.

http://www.nhs.uk/Livewell/Goodfood/Pages/Fat.aspx **(Fat: the facts - scroll down to bottom of page)**

Nutrient	Structure	Function	Sources	Deficiency /Too much
Vitamins or **Micronutrients**	Made from carbon, hydrogen and oxygen	Vitamins are essential to • maintain and promote health • regulate repair of body cells • help prevent deficiency diseases • help combat ageing process • help body release energy from CHO		Micronutrients because only a small amount is needed
Vitamin A Retinol and Carotene Beta carotene (antioxidant) – protect against cancer	Fat soluble Destroyed by heat and air and if fat is rancid	• Helps bone to grow • Keeps eyes healthy • Improves night vision • Helps to keep skin healthy and body linings	Retinol in liver, oily fish, eggs, milk, cheese, butter, margarine ¾ of our Vitamin A comes from retinol Red, green and orange fruit and vegetables such as carrots, mangoes, tomatoes	Long term deficiency could lead to • impaired vision • night blindness • dry skin • slow growth in children (third world) Excess may lead to liver and bone damage
Vitamin D Calciferol, ergocalciferol or cholecalciferol	Fat soluble Very stable to heat –cannot be destroyed by cooking	Helps body to absorb calcium to keep bones and teeth healthy and strong	Most breakfast cereals are *fortified* with Vitamin D Vitamin D is added *by law* to margarine and low fat spreads Oily fish, Eggs Produced under the skin by the sun	Excess Vitamin D is stored in fatty tissues and in the liver Deficiency can cause rickets (bow legs)
Vitamin E **Tocopherol**	Fat soluble Stable when heated	Keeps lungs and red cells healthy Could prevent certain cancers Protects against heart disease	Oils, nuts, cereals, seeds, cereal products, egg yolk	Shortage of Vitamin E is rare
Vitamin K	Fat soluble Stable when heated	Essential for clotting of blood Regulates calcium in blood	Liver, dairy products, meats, fruit, leafy green vegetables, Vegetable oils, cereals	Deficiency can result in • internal bleeding, • haemorrhaging • anaemia

Vitamins B Complex **Vitamin B1 Thiamine** **Vitamin B2 Riboflavin** **Vitamin B3 Niacin** **Folic Acid**	All Water soluble Thiamin is destroyed by heat Riboflavin is destroyed by bicarbonate of soda (alkali) Niacin is not destroyed by heat or alkalis	• Helps release energy fats and CHO • Helps nervous system to function • Normal growth • Releases energy from food • Healthy skin • For metabolism • Forms part of enzyme which releases energy • Essential for healthy skin and nerves Folic acid is essential for • formation of red blood cells • foetal development • prevent spina bifida	Fortified breakfast cereals, whole grains, meat, eggs, milk, brazil nuts, peanuts, Offal such as liver, kidneys, meat, milk, eggs, green vegetables Dried peaches and apricots, peanuts, dairy products, meat, poultry, fish, cereals, grains Offal such liver, kidneys. Wholegrain cereals, pulses, dark green vegetables – spinach, green cabbage, broccoli,	Shortage of Vitamin B1can cause: • Slow growth and development • beri beri if severe deficiency Shortage of Vitamin B2 can cause: • Poor growth rate • Dry skin and eyes Pellagra, rough and sore skin, weakness and depression Shortage of Folic acid can cause: • Anaemia • Tiredness
Vitamin C Ascorbic Acid	Water soluble and is easily destroyed by heat	Vitamin C helps: • wounds to heal • body to absorb calcium and iron from food • protects against infections and allergies • to form connective tissue • to make blood and blood vessels	Citrus fruits: oranges, lemon, limes Soft fruit blackcurrants, strawberries, kiwi Green vegetables, cabbage, new potatoes, peppers	Shortage of Vitamin C can cause; • spotty, poor skin • slow healing wounds • swollen gums • loose teeth • scurvy in severe cases

http://www.youtube.com/watch?v=WpDbuhD1Zh4&feature=related (The Vitamin Song)
http://www.youtube.com/watch?v=zSL5qiey9Ng&feature=related (Vitamins)
Task: Look at a selection or orange drinks. Compare the amount of Vitamin C, sugar and cost of each one.

Name of Orange Drink	Sugar content per 100ml	Amount of Vitamin C per 100ml	Price per litre

Task: Prepare a nutritious snack for a teenager to include as many Vitamins as possible. List the ingredients and state the Vitamins they contain.

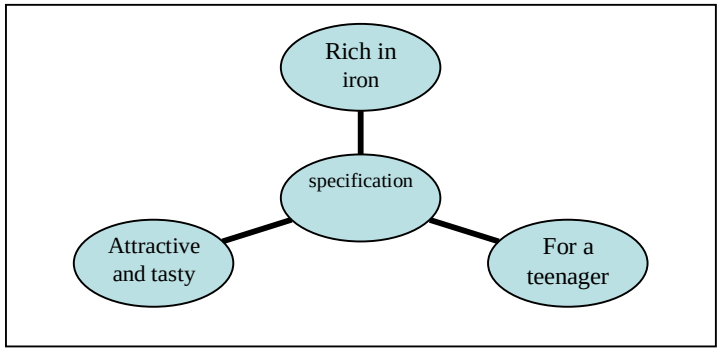
Nutrient	**Structure**	**Function**	**Sources**	**Deficiency /Too much**
Minerals	Micronutrients which are required in small quantities	• Found in most body fluids and cells • Help in building the body (teeth and bones) • Help in controlling the body especially nervous system • Form part of enzymes and proteins for release of energy		
Calcium Growing children and women who are breastfeeding need an increased amount of calcium		• Works with phosphorus and Vitamin D to give strength and hardness to teeth and bones • Clotting of blood after injury • Correct working of nerves and muscles • Correct working of muscles and nerves • Regulates heat in the body	Dairy products –milk, cheese Nuts, meat, Oily Fish ,canned fish (sardines, salmon) Hard water, green vegetables White bread (calsium added by law) Orange juice -some are fortified with calcium Citrus fruit	• Osteoporosis – bones become weak and break • Children's teeth do not form properly • Muscles and nerves do not work properly • Rickets
Iron	Iron is stored in the liver	• Transports oxygen round body • Production of haemoglobin in red blood cells • Needs to be replaced after injury or blood loss	Red meat, offal-kidneys, liver, corned beef, eggs, bread, green vegetables, watercress, parsley, Curry powder, treacle, dried fruit, pulses, plain chocolate, cocoa	• Anaemia • General health is affected • Poor concentration

Phosphorus		• Works with calcium for the development of strong teeth and bones • Muscle and nerve function • Essential for energy production	Dairy products Nuts, bananas, meat, Fish and foods rich in calcium	• Tetany (twitching of hands and feet) • Muscles may become flaccid (floppy) • Tiredness • Depression
Potassium		• Regulates acid balance in the body • Works with sodium • Helps to remove excess sodium • Could prevent high blood pressure	Dried fruit, yeast extract, pulses, whole grains, fruit juices leafy green vegetables	• Can cause heart attacks
Sodium	Forms part of the flavour enhancer *monosodium glutamate*	• Maintains water balance in body • Nerve transmission • Body needs sodium especially in hot climates (lost in sweat)	Fish, added to most manufactured food, cheese, bacon, smoked meats, Table salt	• Sodium deficiency highly unlikely in UK • People who suffer high blood pressure, kidney, heart, liver disease may need a salt-free diet
Fluoride	Fluoride can be added to water and toothpaste	• Strengthens teeth against decay • Makes teeth resistant to acid produced by bacteria	Fish, tea, drinking water, toothpaste	Deficiency can cause: • Tooth decay •Too much can cause dark spots on teeth
Iodine	Part of hormone thyroxin which is produced by the thyroid gland	• Thyroxin controls the metabolic rate • Development of foetal nervous system	Fish from the sea, seaweed, foods grown near the sea, water, milk, meat, eggs	• In adults thyroid gland will increase in size in an effort to produce more thyroxin (goitre) • Basal metabolism is lowered

http://feedroom.businessweek.com/index.jsp?fr_story=a7f8f8a4eb97707fde89c86c1e1ad41bf21e7e25 (Fortified Food)

Task: Design and make a food product that meets the following specification
Explain how your design meets the requirements of the specification
Label and colour your design.
Use nutrition software to determine the iron content:

i. of the product
ii. of a portion



Substance	Structure	Function	Source	Deficiency /Too much
Water	65% of human body is made of water We need a lot of water every day	• helps regulate body temperature • transports nutrients, oxygen and CO2 round the body • is needed by all body processes • helps kidneys to flush out harmful substances from blood • kidneys filter waste products from body as urine • water is essential for life	Water, milk, all drinks Fruit, melon, vegetables such as cucumber	• there must be a balance between input and output of water or *dehydration* will occur

Task: Investigate the range of bottled water available in the supermarkets. Make a list of the claims stated.

http://www.youtube.com/watch?v=LIeR6SoQ84A (Bottled Water: The Big Picture)

Task: Discuss the implication of bottled water on the environment.