

20

NUTRITION

20.1 Introduction

In the previous lesson we have read about food, its importance, and also about its function . In this lesson we will learn about the important components of food, and the very important question of what and how much to eat, so that one is healthy and fit.

In this lesson you will also be introduced to the terms like nutrients, balanced diet etc.

20.2 Objectives

After reading this lesson you will be able to:

- name the various nutrients and enumerate their sources and functions;
- categorise the foods into groups on the basis of the prominent nutrients they supply;
- know the nutritional requirements in terms of Recommended Dietary Intake;
- explain the term balanced diet.

20.3 Nutrition

Let us see what is the meaning of nutrition.

All of us eat food. Food provides nourishment to the body and enables it to stay fit and healthy. The food that we eat undergoes many processes, like, first, the food is digested, then it is absorbed into blood and transported to various parts of the body and then utilised. The waste products and undigested food are excreted from the body.

NUTRITION is the process by which food is taken in and utilised by the body.

NUTRITION = Eating -> Digestion -> Absorption -> Transportation -> Utilization

Nutrients and their Functions

We all know that food helps in the nourishment and health of our body. The nourishment is brought about by nutrients, which are present in food. Now what are these nutrients ?

Nutrients are the chemical substances present in foods and are responsible for nourishing the body.

Nutrients are of two types :

1. Macronutrients
2. Micronutrients

Both macronutrients and the micronutrients are equally essential for good health. Each nutrient plays a significant role in the body.

1. MACRO NUTRIENTS

They are present in large quantity in foods and are also required in large quantity for the body.

Carbohydrates, proteins, fats and oils and water are macronutrients

A. Carbohydrates

(i) Available carbohydrate

Carbohydrates are present in large quantity as starch cereals, legumes, pulses and potatoes. They are present as simple carbohydrate in common sugar, jaggery, fruits, honey and milk.

Starch and sugars are easily digested and provide energy (4 Kcal/g).

(ii) Unavailable carbohydrates or dietary fibre

They are present in the form of celluloses and hemicellulose which are not digested in our system. They add bulk to the stool and help in easy defecation process.

Energy can be derived from carbohydrate, fats and proteins, but carbohydrates are the cheapest source of energy. If there is a short supply of carbohydrates and fats in your body, proteins are utilised for energy production. Therefore, carbohydrates have to be consumed in proper amounts to spare proteins for body building purpose.

Functions of carbohydrates are summarised here.

- Carbohydrates provide *energy*
- Carbohydrates are the *main sources* of energy
- Carbohydrates *spare proteins* for body building function
- Dietary fibre increases the stool bulk and *helps in defecation*

* Kilo calorie: A measure of the energy in food.

* 1 gm of carbohydrate gives 4 kcal/g of energy.

Food sources of carbohydrates are:

- Cereals - wheat, rice, bajra , maize etc.
- Roots and tubers - potatoes, sweet potatoes, beetroot and tapioca
- Sugar, jaggery
- Fruits
- Milk
- Leafy vegetables.

B. Proteins

Proteins are made up of smaller units known as amino acids. There are altogether 22 amino acids out of which there are 8 amino acids which our body cannot manufacture. The rest our body can manufacture.

Essential amino acids— which our body cannot manufacture and hence have to be supplied by diet .

Non essential amino acids—Those amino acids which our body can manufacture.

Function and sources of proteins are:

1 gm of protein gives
4kcal/gm of energy

Functions	Sources	Special features
(i) Needed for growth, maintenance and repair of tissues	— Meat, poultry, fish, eggs. — Milk, cheese, paneer curd. — Groundnuts, soy-beans, peas, pulses, wheat	(i) Animal proteins, i.e. proteins that we get from meat, eggs, milk etc. are better than vegetable proteins, i.e. proteins that we get from wheat, pulses, etc.
(ii) Necessary for production of enzymes, hormones, antibodies, haemoglobin, etc.		
(iii) Help in the clotting of blood.		(iii) Including two or more sources of proteins in each meal helps to improve the quality of proteins and their utilisation.
(iv) Provide energy, if necessary		

Note : When the body does not get enough carbohydrates or fats to meet its energy needs, proteins are broken down to supply these calories. However, proteins that are used for energy are not available for other vital functions that can be carried out only by proteins.

Activity : Think of five recipes that you can prepare at home by mixing two types of proteins. List them in your record book.

C. Fats and Oils

Fats and oils are the concentrated source of energy in our diet. Do you think there is any difference between fats and oils? Yes, you are right, there is a difference.

If a substance is liquid at 20° C, it is called **oil** and if it is solid at that temperature, it is known as **fat**. Fats are made up of triglycerides which contain glycerol and fatty acids. The nature of fats is dependent on the type of fatty acids present. Fatty acids may be saturated or unsaturated. Saturated fatty acids are found in solid fats whereas oils contain more of unsaturated fatty acids. Vegetable oils are rich in unsaturated fatty acids.

Activity : List down five fats and oils that are used in your house.

Functions and sources of fats and oils:

Functions	Sources	Special features
(i) Provide energy. Concentrated source of energy.	— Vegetable cooking oils, ghee, butter — Oil seeds, nuts	(i) Fats improve the texture and absorb and retain flavours making meals more appetising.
(ii) Reduce the use of proteins for energy.	— Meat, poultry, fish, eggs. — Whole milk, cheese	(ii) Fats have characteristics that cause them to remain in the stomach longer and prolong the feeling of fullness.
(iii) Carry fat-soluble vitamins (A., D., E., K.) into the body and help in the absorption of these vitamins.		
(iv) Help to maintain body temperature. The layer of fat under the skin helps to conserve body heat		
(v) Act as a cushion to certain vital organs.		
(vi) Help in growth of tissues.		

Intext Questions 20.1

1. Fill in the blanks:

- 1 gram of fat provides about of energy to the body.
- Growth and repair of body tissues is the main function of

* 1 gm. of fat gives 9 kcal of energy

(c)are the building blocks of all proteins .

2. Indicate whether true or false.

- (a) The energy giving function is the major function of protein.
 (b) Haemoglobin is the red coloured substance present in the blood.
 (c) Combination of cereals and pulse in a meal greatly increases the quality of protein.
 (d) Fats are made up of glycerol and 4 fatty acids.

D. Water

Water is the major constituent of our body. It is present in all cells. It helps in the transportation of nutrients in the body. It helps to excrete unwanted materials in the form of urine. It surrounds tissue and organs and gives protection from shocks.

Water is the major constituent of our body and is present in all cells.

Whenever you are thirsty, you drink water. You have to take plenty of water as such or in the form of milk, juice or kanji. When you suffer from diarrhoea, you loose water from the body very fast. Therefore water should be replaced by drinking.

2. MICRONUTRIENTS

Other important nutrients which are present in small quantities in foods but yet essential to our body are called **micronutrients**. They are minerals and vitamins and are required in very small quantities for the body.

Minerals and vitamins are called micronutrients

Let us study some of the important micronutrients.

1. Vitamins

Our body contains very little quantities of vitamins, however you will be surprised to know that they are responsible for all the major functions of the body. These vitamins are of two types:

- (i) Fat soluble : A,D,E, & K
 (ii) Water soluble: B & C.

Now let us study the functions and food sources of these vitamins.

(i) Fat Soluble Vitamins: Their Functions and Sources

Nutrients	Functions	Sources	Special Features
Vitamin A	(i) Essential for proper functioning of eyes i.e., Dim light vision.	— Liver, eggs, fish liver oils. — Milk and its products.	(i) The true vitamin A or 'retinol' is present only in animal sources. The plant sources contain 'carotene' which the body converts into Vitamin A

Nutrients	Functions	Sources	Special Features
Vitamin D	(ii) Necessary for healthy skin and linings of nose, mouth, throat, eyes, ears, lungs and other organs.	<ul style="list-style-type: none"> — Green leafy vegetables, spinach. — Yellow fruits and vegetables such as pumpkin, carrot, papaya, mango, etc. — Refined oils and vanaspati fortified with vitamin A. 	(i) Foods are not a very good source of vitamin D. (ii) Production of vitamin D by the skin in the presence of sunlight is the main source.
	(i) Necessary for formation and maintenance of strong, healthy teeth and bones.	<ul style="list-style-type: none"> — Exposure of skin to sunlight <p>When the body is exposed to the sun rays, a substance in the skin is converted into vitamin D and transferred to the blood stream.</p>	
Vitamin E	(ii) Helps in the proper absorption and utilisation of calcium and phosphorus in the body.	<ul style="list-style-type: none"> — Eggs, liver, fish liver oils. — Milk, butter — Refined oils and ghee fortified with vitamin D. 	Cases of vitamin E deficiency are almost non-existent.
	(i) Prevents combining of oxygen with substances that would get destroyed if they did take up oxygen. Protects vitamin A from getting destroyed in this manner.	<ul style="list-style-type: none"> — All cereals, pulses vegetable oils. 	
Vitamin K	(i) Necessary for clotting of blood.	<ul style="list-style-type: none"> — Formed in the intestine by bacteria normally present there. — Green leafy vegetables. — Egg, liver 	Vitamin K deficiency normally does not occur.

(ii) Water Soluble Vitamins: Their Functions and Sources

Nutrients	Functions	Sources	Special Features
Vitamin B	(i) Necessary for utilisation of carbohydrates in the body.	<ul style="list-style-type: none"> — Liver, poultry, meat, fish, eggs. — Whole grain cereals and pulses 	There are eight B vitamins. Together they are called vitamin B-complex. They are generally found in the same foods and carry out related functions in the body.
	(ii) Necessary for normal functioning of nervous system.	<ul style="list-style-type: none"> — Green leafy vegetables — Milk 	
	(iii) Essential for proper growth.		
	(iv) Helps body organs to function normally.		

Nutrients	Functions	Sources	Special Features
	(v) Needed for formation of red blood cells.		
	(vi) Helps in digestion and makes us feel hungry.		
Vitamin C	(i) Necessary for the formation of the substance that holds cells together.	— Fruits like amla, oranges, lemons, guava, etc. — Green leafy vegetables, e.g. spinach, cabbage	
	(ii) Needed for strong teeth and bones.	— Sprouted pulses such as grams	
	(iii) Helps in the production of haemoglobin.	— Liver	
	(iv) Helps in the utilization of other nutrients in the body		
	(v) Helps in fighting the disease-causing germs.		

Intext Questions 20.2

1. Classify the vitamins A, B, C, D, E and K as:

Water soluble vitamins

Fat soluble vitamins

2. Given below are some food items. In front of each, write down the vitamin/vitamins they contain:

(i) carrots

(ii) amla

(iii) cereals

(iv) green leafy vegetables

(v) pulses

(vi) eggs

3. State whether the following statements are 'True' or 'False'. Correct the false statements.

(i) When the body is exposed to heat, then vitamin C is produced in the skin.

(ii) Vitamin A helps to keep our eyes healthy.

(iii) Vitamin K plays a role in our feeling hungry.

(iv) Vitamin E is necessary for clotting of blood.

(v) Vitamins A and D are necessary for strong and healthy teeth and bones.

b. Minerals

Minerals constitute a very small amount of the total body tissues. But these are essential for many vital processes and also for the maintenance of the body. In total there are 19 minerals required by the body in various amounts.

Let us now study some of the important minerals.

Calcium: Calcium and phosphorous are available in sufficient quantity from in curds, green leafy vegetable, ragi and oil seeds. Other foods also provide fair quantity of calcium.

The major function of calcium is to help in the formation of blood clotting and muscular contraction.

Calcium is necessary for bone formation, blood clotting and muscular contraction.

Iron: Iron is required in very small quantity by the body. It is an important material present in haemoglobin. Haemoglobin is present in red blood cells and is responsible for the red colour of blood. Whole grain cereals and pulses contribute iron to your body. Other sources of iron are green leafy vegetables, egg yolk, liver and meat. In our country, majority of the population, especially women and children, suffer from iron deficiency disease, called **anaemia**.

This is not because people do not consume food which are sources of iron but because the absorption and utilisation of iron is poor due to the presence of oxylates and phytates in our diets. Vitamin C and protein help in better absorption of iron. The oxylates and phytates are called *inhibitors* while vitamin C and protein are known as *enhancers*. Primary health centres are distributing iron tablets to women and children to overcome anaemia.

Iron is essential for haemoglobin formation.

Iodine: Iodine is an important substance present in thyroxine hormone produced from thyroid gland. Thyroxine regulates various functions of the body. We get iodine from water and food. The plants which grow in soil are rich in iodine and provide iodine for us. Sea foods are rich in iodine. Iodine deficiency disease is known as goitre or enlargement of the neck region. Deficiency of iodine causes mental retardation in children. It has been identified in many parts of India. To avoid goitre we must have iodine rich sources in our daily meals. Iodised salt is a good source of iodine and we must use it instead of the regular salt.

Iodine is necessary for growth and development

Certain food stuffs like cabbage, cauliflower radish, ladies fingers, oilseeds contain a substance known as *goitrogens* which interfere with the body's ability to produce and use thyroxin. These goitrogens are destroyed on cooking. Therefore, the above mentioned food stuffs should be cooked before eating.

Intext Questions 20.3

Fill in the blanks:

1. Iodized salt is a good source of
 2. Calcium is necessary for
 3. For absorption of ironand are necessary .
 4. and interfere with the absorption of iron in the body.
 5. Iron is required for
 6. Bones in our body are made up of
 7. One of the reasons for mental retardation in children is lack ofin daily meals.
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20.5 Nutrient Requirements

Now we know that all the nutrients are required for good health. But *how much* should we eat, so that the nutritional requirements are met? There are various factors which influence the nutritional requirements of an individual . These are as follows:

Nutritional requirements are influenced by :

- age
- height/weight
- sex
- climatic condition
- health
- occupation
- physiological condition .

Indian council of Medical Research (ICMR) after conducting a lot of research has recommended nutritional intakes for various age groups. The following table shows the daily Recommended Nutritional Intakes (RDI).

Table 20.1
SUMMARY OF RDI FOR INDIANS (1989)

(Recommended by ICMR)

Group	Particulars	Body wt kg.	Net energy Kcal/d	Protein g/d	Fat mg/d	Cal- cium mg/d	Iron mg/d	Vit. A. Reti- nol mg/d	B-car- otene	Thia- min mg/d	Ribo- flavin mg/d	Nico- tinic acid mg/d	Pyri- doxin mg/d	Ascor- bic acid mg/d	Folic acid mg/d	B-12 mg/d
Man	Sedentary work		2425							1.2	1.4	16				
	Moderate work	60	2875	60	20	400	28	600	2400	1.4	1.6	18	2.0	40	100	1
	Heavy work		3800							1.6	1.9	21				
Woman	Sedentary work		1875							0.9	1.1	12				
	Moderate work	50	2225	50	20	400	30	600	2400	1.1	1.3	14	2.0	40	100	1
	Heavy work		2925							1.2	1.5	16				
	Pregnant woman Lactation	50	+300	+15	30	1000	38	600	2400	+0.2	+0.2	+2	2.5	40	400	1
	0-6 months 6-12 months	50	+550 +400	+25 +18	45	1000	30	950	3800	+0.3 +0.2	+0.3 +0.2	+4 +3	2.5	80	150	1.5
Infants	0-6 months	5.4	108/kg	205/kg		500				55mg/kg	65mg/kg	710mg/kg	0.1	25	25	0.2
	6-12 months	8.6	98/kg	1.65/kg				350	1200	50mg/kg	60mg/kg	650mg/kg	0.4			
Children	1-3 years	12.2	1240	22			12	400		0.6	0.7	8			30	
	4-6 years	19.0	1690	30	25	400	18	400	1600	0.9	1.0	11	0.9	40	40	0.2-1.0
	7-9 years	26.9	1950	41			26	600	2400	1.0	1.2	13	1.6		60	
Boys	10-12 years	35.4	2190	54			34	600	2400	1.1	1.3	15	1.6	40	70	0.2-1.0
Girls	10-12 years	31.5	1970	57	22	600	19			1.0	1.2	13				
Boys	13-15 years	47.8	2450	70	22	600	41	600	2400	1.2	1.5	16				
Girls	13-15 years	46.7	2060	65			28			1.0	1.2	14	2.0	40	100	0.2-1.0
Boys	16-18 years	57.1	2640	78	22	500	50	600	2400	1.3	1.6	17				
Girls	16-18 years	49.9	2060	63			30			1.0	1.2	14	2.0	40	100	0.2-1.0

Have you noticed that a sedentary worker needs lesser calories than a person performing heavy work?

There is a difference in energy requirements of males and females and the physical state of the person. Notice the difference in nutritional requirement of a woman during pregnancy and lactation and between boys and girls / men and women.

If you take a closer look at the above table, you will find the recommendations for infants, preschool and school children, adults and adolescents. Variations in energy needs according to activity are indicated in adult stage. Special requirements of pregnancy and lactation are also covered in the recommendation. A liberal margin of safety is provided in the recommended allowance to cover individual difference for needs of nutrients.

Table 20.2

CLASSIFICATION OF ACTIVITIES BASED ON OCCUPATIONS-

	<i>Sedentary work</i>	<i>Moderate work</i>	<i>Heavy work</i>
Male:	Teacher, tailor, barber, executive, shoemaker, priest, retired personnel, landlord, peon, postman etc.	Fisherman, basket-maker, potter, goldsmith, agricultural labourer, carpenter, mason, rickshaw-puller, electrician, fitter, turner, welder, industrial labourer, cooli, weaver, driver, etc.	Stone-cutter, blacksmith, mine-worker, wood-cutter, gang-man etc.
Female:	teacher, tailor, executive, housewife, nurse etc.	Servant-maid, cooli, basket-maker, weaver, agricultural labourer, beedi-maker, etc.	Stone-cutter

Activity Consult the tables 20.1 and 20.2 and see where your family members are according to the factors you have studied .

20.6 Balanced Diet

In this lesson, we have studied about the nutrients, their sources and importance and also about nutritional requirements . Sometime back we raised a question- what should we eat so that our nutritional requirements are met? Do you think you can answer this question now? Yes, you are right — you should eat food items which provide your body all these nutrients. Such a meal is called a balanced diet. By meeting our nutritional requirements such a diet helps us in staying healthy. It also provides for storage of some amount of nutrients in the body. This helps the body to withstand short periods of low dietary intake.

A balanced diet is one which contains different types of foods in such quantities that the individual's need for the various nutrients is adequately met, and some amounts of nutrients are stored in the body to enable it to withstand short periods of low dietary intake.

Characteristics of a Balanced Diet

A balanced diet contains both plant and animal foods and fulfils following requirements:

- meets the nutritional requirements of the particular individual.
- includes foods from all the food groups.
- contains a variety of foods.
- consists of seasonal foods.
- is economical.
- suits the taste and meets the desires of the individual eating it.

Intext Questions 20.4

Tick mark (✓) the most appropriate answer:

1. Nutrition is the process by which the food is taken in and
 - (a) digested in the body
 - (b) absorbed in the body
 - (c) utilised in the body
 - (d) all the above.
2. The macro nutrients are carbohydrate, oils and
 - (a) proteins and water
 - (b) proteins and vitamins
 - (c) proteins and minerals
 - (d) all the above.
3. Micro nutrients are
 - (a) vitamins, water
 - (b) vitamins, minerals
 - (c) sugars and minerals
 - (d) all the above.
4. The amounts of nutrients required by different people are
 - (a) the same
 - (b) generally the same but occasionally different
 - (c) at times the same and at times different.
 - (d) different.
5. A balanced diet should consist of
 - (a) both plant and animal foods.
 - (b) only plant foods.
 - (c) only animal foods.
 - (d) none of the above.
6. A balanced diet is one which has
 - (a) some nutrients in the required amounts.
 - (b) foods from one food group in the correct amounts.
 - (c) all the nutrients in the correct amounts.
 - (d) all the foods that a person likes to eat in the correct amounts.

20.7 Food Groups

The knowledge of recommended dietary allowance and composition of food is necessary for the selection of an adequate diet. But if we start doing this, it will be a tedious process. Therefore it is necessary to translate the nutritional needs into kinds and amounts of food that we should eat. Such an information can then be used in everyday meal planning exercise. This is achieved by dividing/categorising all food items into various groups called *food groups*. Now let us see what is a food group? A food group, quite simply, *consists of a number of food items sharing some common characteristics*. It can be on the basis of:

- The nutrients.
- The physiological function performed.

Let us see the two ways of classifying food into groups.

A. Classification Based on Physiological Functions

In the previous lesson you have studied that food has three basic physiological functions. Can you remember these? Yes, energy giving, protection, repair and growth, protection from diseases. Foods are also classified according to their function. Now we will study the classification based on the predominant nutrients which they supply.

In our country we normally follow five food group system, which is recommended by ICMR.

Five Food Group System

Food Group	Main Nutrients
1. Cereals, Grains and Products Rice, wheat, ragi, bajra, maize, jowar barley, riceflakes, wheat flour.	Energy, protein, invisible fat, vitamin-B ₁ , vitamin-B ₂ , folic acid, iron, fibre
2. Pulses and Legumes Bengal gram, blackgram greengram, redgram, Lentil (whole as well as dhals), cowpea, peas rajmah, soybeans beans etc.	Energy, protein, invisible fat, vitamin B ₁ , vitamin B ₂ , folic acid, calcium, iron, fibre
3. Milk and Meat Products <i>Milk:</i> Milk, curd, skimmed milk, cheese <i>Meat:</i> Chicken, liver, fish, egg, meat	Protein, fat, vitamin B ₂ , calcium Protein, fat, vitamin B ₂
4. Fruits and Vegetables <i>Fruits:</i> Mango, guava, tomato ripe, papaya, orange, sweet lime, water melon,	Carotenoids, vitamin-C, fibre

<p>Vegetables (Green Leafy) Amaranth, spinach, gogu drumstick leaves, coriander leaves, mustard leaves, fenugreek leaves.</p>	<p>Invisible fats, carotenoids, vitamin B₂, folic acid, calcium, iron, fibre</p>
<p>Other Vegetables: Carrots, brinjal, ladies- finger, capsicum, beans, onion, drumstick, cauliflower</p>	<p>Carotenoids, folic acid, calcium, fibre</p>
<p>5. Fats and Sugars</p>	
<p>Fats: Butter, ghee hydrogenated oils, cooking oils like ground nut, mustard, coconut oil</p>	<p>Energy, fat, essential fatty acids</p>
<p>Sugars: Sugar, jaggery</p>	<p>Energy</p>

In this system of food grouping, similar food items are placed together. For example, all cereals are similar in nutrient contents and all pulses are also similar in nutrient contents. Similarly, milk, egg and flesh foods are comparable and all oil, butter, ghee have similar nutrients. Therefore if we substitute one food for the other in the same group we will, to a large extent, get the same nutrients. For example, whether we select wheat flour or rice or bajra we would get approximately the same nutrients.

Making food groups on the basis of nutrients has the following advantages :

- When you want a particular nutrient you know which group of foods to look for;
- Foods in the same group provide same nutrients, in more or less the same amount Hence you can easily exchange one food for the other. This is called **food exchange**.

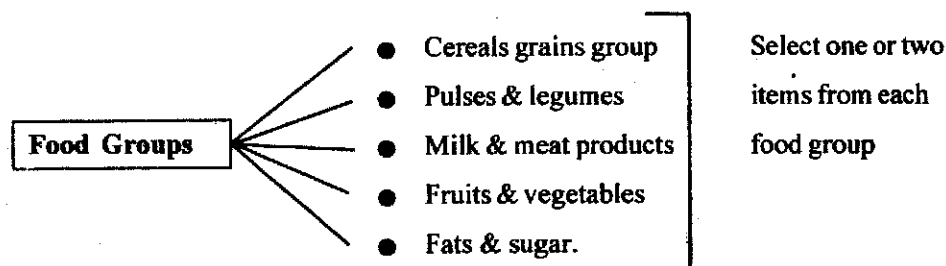
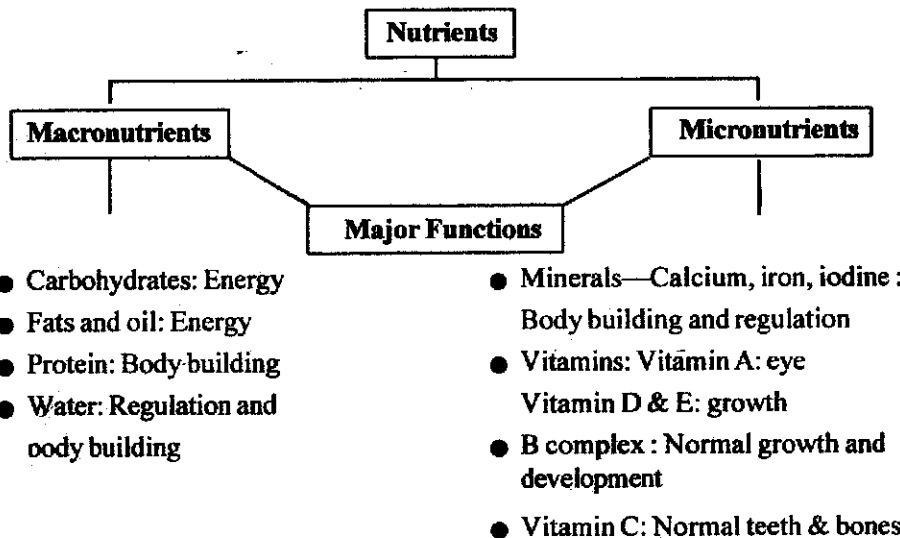
Exchanges Make Diet Planing Easy

Intext Questions 20.5

1. In how many ways can foods be classified?
2. List down the 5 food groups.
3. What is food exchange ? Give one example.

20.8 What You Have Learnt

NUTRITION-> Eat -> Digestion-> Absorption -> Transportation -> Utilization



Balanced Diet: Contains food from all the food groups.

20.9 Terminal Exercise

1. Define macronutrients and micronutrients.
2. List the functions of carbohydrates and proteins.
3. List the factors that influence the nutritional requirements of an individual.
4. Name the five food groups and give two examples of each group.
5. Define balanced diet and state its characteristics .

20.10 Answers To Intext Questions

- 20.1
1. (a) 9 (b) Protein (c) Amino acids
 2. (a) False (b) True (c) True (d) False
- 20.2
1. Water soluble—Vitamin B & C
Fat soluble — Vitamin A, D, E, K

2. (i) a (ii) c, a (iii) b (iv) a, b, c
 (v) b (vi) b, a
3. (i) false, Vitamin D (ii) true (iii) false
 (iv) false, Vitamin K (v) false, Vit. D.
- 20.3**
1. Iodine
 2. Bone development
 3. Vitamin C & protein
 4. Only fats & phytates
 5. Haemoglobin products
 6. Calcium
 7. Iodine
- 20.4**
1. (d)
 2. (a)
 3. (b)
 4. (d)
 5. (a)
 6. (c)
- 20.5**
1. On the basis of nutrients and functions.
 2. Cereals and grain group
 - (i) Pulses & legumes
 - (ii) Milk & meat products.
 - (iii) Fruits & vegetables
 - (iv) Fats & sugars
 3. Refer to text