
UNIT 12 MENU PLANNING

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12.1 INTRODUCTION

You have learnt from the previous units that our body's many functions, be it physical activity, mental exercise, growth (in the case of children) or convalescence after an illness, require various nutrients delivered by an array of foods that we eat. We have also seen that the nutrients work in a perfect harmony, much like the keys of a piano; one key not reaching the perfect pitch could mean a discordant note! For example, bone formation requires, besides calcium (Ca), phosphorus (P) and vitamin D also in specific amounts—a lack of any one would mean improper bone formation—indicating that a perfect symphony of all the nutrients is required to ensure a good health.

We have also learnt that factors such as age, gender, physique, physiologic conditions and the level of physical activity influence the requirements for various nutrients. Apart from these, climatic conditions, growth and pathological stress also influence the need for the various nutrients. It is not enough if we, as dietitians, have just in-depth knowledge of the nutrients and the nutritive value of foodstuffs. We must be able to apply this knowledge to plan and also quickly calculate the nutritive value of the menus for various conditions served to the people under your care with the help of a simple device known as an 'exchange list'. In this unit, we will learn about the exchange list and the rationale for menu planning. What is menu planning? Why do we need to plan menus? What factors should be considered while planning menus? What are the steps involved in it? These are a few issues highlighted in this unit. Finally, we shall learn about menu planning for adults with respect to their nutrient needs.

With women playing important role in providing nutritious meals both at home and in the healthcare units, it is desirable that we have a basic awareness of the scenario of health and nutrition situation of women at various levels, This is the other important aspect covered in this unit.

Objectives

After studying this unit, you will be able to:

- present the rationale behind the interesting and challenging task of menu planning,
- enumerate the factors which influence our food choices, and hence need to be considered in menu planning,
- describe the aims of menu planning and the steps involved,
- apply the knowledge of the menu planning to plan and also quickly calculate the nutritive value of the menus for various conditions,
- explain the various factors to be kept in mind while planning diets for adults,
- critically comment on the scenario of health and the nutrition situation of women at various levels, and
- plan a few low-cost menus for adults.

12.2 MENU PLANNING

Any individual who carries the responsibility of providing meals has to take decisions regarding what to serve, how much to serve, how much to spend, where to shop, how much to buy, how to prepare food, how to serve meals, at what hour to serve meal and so on. All such decisions are a part of planning meals. Extending this concept further, one could define meal planning as *a simple practical exercise which involves applying the knowledge of food, nutrient requirement and individual preferences to plan adequate and acceptable meals*. In other terms, meal planning means *planning for adequate nutrition*.

Remember meal planning is just not an exercise of selecting the right kind of foods to help meet the nutrient needs. It also concerns with preparing/planning attractive and enjoyable meals for all persons. Meals must taste good, smell good. Because food is seen before it is tasted, the eyes have a role as well, in food acceptance. Meals must 'look good' to be tasted to be enjoyed. To do this, the planner does not have to be knowledgeable only, but also imaginative and creative. The art of skillful blending of foods in terms of colour, texture and flavour must be known. In this context, therefore, it is said that meal planning is an art. It is an **art** which develops through thought and inspiration. Meal planning, in fact, is a skill which improves with practice.

12.2.1 Rationale for Menu Planning

'Menu', as we all know, is nothing but *a list of dishes planned for preparation*, and forms the very core of all activities in the food service establishment. Although it may seem a simple exercise of providing something to eat and drink, in practice, good menu planning requires a lot of skill. It involves planning of balanced meals that are colourful, appetizing, palatable and within the economic means of the individuals concerned. When a food has to be bought, prepared and served in large quantities to people of varying tastes and requirements, as is the case in hospital food service, due consideration needs to be paid for this activity. It is essential to provide appetizing, nourishing and attractive meals to the people at a reasonable price. This is possible only if the meals are planned in advance; for example, price advantage can be obtained by *buying seasonal foods* and in quantities which carry discount.

What are the other advantages? Can you list a few of these? Well, planning in advance helps to determine *quantities of different foods* accurately. Food buying can thus be controlled through advance buying because the quantities need to be calculated beforehand. Time and effort spent on haphazard ordering, shopping and receiving of food materials is saved to a large extent. Planning in advance helps to

avoid monotony in the menus drawn; *variety in terms of colour, flavour and texture* and different methods of cooking could be given due consideration if the menu is planned in time. If the meal does not satisfy the budget, it cannot be put into practice. Bulk purchasing, including seasonal foods all help in this; this means that menu planning has to be done in advance. The dietitian is responsible for giving clear-cut instructions to the kitchen staff to ensure harmony among the staff involved in preparation. This is possible only if the menus are planned in advance. The quantity of nutrients for the day for patients with various diseases, its distribution between the various meals of the day all need due consideration so that the people are satisfied with the service provided. This is not possible without planning menus in advance.

Having understood the rationale for menu planning, we will learn the factors that affect the food choice, next.

12.3 FACTORS AFFECTING FOOD CHOICE

As a dietitian, it is necessary to understand how our food choices are affected. Everyday we make food choices which influence our health for better or worse. Every day's choice may benefit/harm our health only a little, but when these choices are repeated over years and decades, the rewards and consequences can become major.

Various factors influence our food choices. In this section, we shall review these factors. We begin with the nutritional factors.

12.3.1 Nutritional Factors

Food choices made based on sound principles of nutrition will be conducive to good health while carelessness about nutrition can contribute towards many of the today's most prevalent chronic degenerative diseases of later life, such as heart diseases. Remember, we don't consume nutrients as such, but as meals/dishes made up of foodstuffs containing the nutrients in various amounts. Knowledge of food groups will help one to formulate a healthy diet. The various foods in a food group are similar in a general chemical (nutrient) composition, and hence contribute almost similar types of nutrients to the diet, although not always in the same proportion. At this point, it is worthwhile to learn about the evolution of the concept of *Food groups*. In the 1940s, nutritionists began translating RDA into more practical terms so that people with no special training in nutrition could still estimate whether their nutritional needs were being met. A seven-food-group plan was one of the early formats. Daily food choices had to include food from each food group. This plan was simplified into five-food-groups. By the mid-1950s, a four-food-group plan was established that included **milk** group, meat group, fruit-vegetable group and bread and cereal group. In 1979, the names of the groups were revised, and a fifth group containing fats, sweets and alcoholic beverages was added as a part of the "Hassle-free Daily Food Guide". Caution needs to be urged in consuming this last group, though it can supply essential fatty acids and vitamin E.

The following discussion briefly summarizes the nutritive value of each of these food groups. Let us begin our discussion with cereals.

1) *Cereals and Bread Group*

- Cereals form the staple of the Indian diet.
- These grains are the main source of energy in the Indian diets contributing as they do 60-70% of daily energy intake of majority of Indians. This is because they are rich sources of carbohydrates.

- Proteins in cereal grains, as you may recall studying earlier, are partially complete as cereals are low in one or two essential amino acids – lysine and threonine. However, cereals when eaten with pulses, as is the common practice in India, the protein quality improves due to mutual supplementation between the cereal and pulse proteins, the former being deficient while the latter (pulse) being rich in lysine.
- Cereals are low in fat, but contain 1-3% omega-3 fatty acids.
- Cereals in general, cannot be considered rich sources of minerals. However, ragi is rich in calcium (i.e. 344 mg/100 gm); bajra, and whole wheat flour are high in iron content. The non-nutrient factors such as phytates, oxalates and fibres which are present in them interfere with the absorption of calcium and iron.
- Cereals, particularly the whole grains, are important sources of B-vitamins. Since most of these vitamins reside in the outermost layer of the grains, they are lost depending on the extent of polishing and refining. Parboiling, which involves soaking in water and subsequent steaming of paddy, results in seeping of vitamins present in outer layer into the grain; thus parboiled milled rice retains much of the vitamins.

Cereals are neither rich in vitamin A nor C; they don't contain any vitamin B₁₂ either; however, whole grain cereals are rich in the other B-vitamins.

2) *Pulse/Meat, Poultry/Sea Food Group*

They are excellent sources of protein, containing 25% protein, but varying from each other in other respects. Let us discuss each of these groups and find out what these differences are.

a) *Pulse group*

- Pulses are rich sources of proteins (20-25 g/100 g), the *limiting amino acid* being *methionine*. However, protein quality can be improved by mutual supplementation with cereals. Soybean has exceptionally high protein content (43 g/100 g). Besides, they have carbohydrates in fair amounts.
- Pulses are fairly rich in iron, with soybean, cowpea, black gram and horse gram being exceptionally rich.
- Sprouting or germination of legumes, a practice common in our households, brings about beneficial effects. Vitamin C, which is practically absent in dry pulses, increases in significant amounts upon sprouting; folic acid also increases threefold. Interestingly, sprouting brings about a decrease in flatus-forming compounds originally present in non-germinated pulses. Sprouted pulses require a much shorter time to get cooked. The *antinutritional* factors such as *trypsin* inhibitors, are inactivated by sprouting, thus rendering them more easily digestible.

b) *Fish and Sea-foods group*

- They are rich sources of proteins (20-25%) of a high biological value. Dry fishes contain more (60%) proteins since most of the moisture is lost.
- Dried fishes have exceptionally high amounts of calcium since it is consumed with the bones.
- Some varieties of fish such as hilsa, seer, katla, pomfret and mackerel are rich in omega-3 fatty acids, which are known to protect against cardiovascular diseases.

c) *Meat and Poultry group*

- Meat and poultry are rich sources of proteins of high biological value.
- They do not contain carbohydrates.

- All the meats except egg yolk contain haem iron; therefore, the iron is well absorbed. However, egg yolk contains non-haem iron; the phosphitin which is present in egg yolks interferes with iron absorption but consuming vitamin C in the same meal helps to overcome this problem.
- Egg yolk is rich in vitamin A and p-carotene, while liver is rich in vitamin A.
- Red meats are rich in saturated fats, while fish and poultry contain very small amounts of fats. Lean meats contain less fat.
- Organ meats such as liver, kidney and brain and egg yolks are rich in cholesterol. Including large amounts of such foods in the diet, especially along with saturated fats in the diet has been shown to result in high serum cholesterol which is a risk factor for coronary heart diseases.
- Flesh foods are rich in iron, zinc and vitamin B₁₂, but are devoid of fibre and vitamin C.

3) Dairy/milk Group

This first food of mammals is rich in body-building proteins and bone-forming calcium, besides being the only source of vitamin B₁₂ for the vegetarians. However, milk does not contain vitamin C, besides being deficient in iron. Dairy milk of varying fat contents is available in the market, the highest fat milk being known as *full fat milk*, the next known as *standard* milk and the lowest is *skim* milk. Low fat dairy milk is better suited for adults, especially the ones who want to watch their weights and have a check on their cholesterol levels. Curds are an ideal substitute for people who have problem in digesting milk due to the deficiency of the enzyme lactase.

4) Vegetable-Fruit Group

The vegetables and fruits add colour and variety to our diets in addition to providing a host of essential nutrients and phytonutrients that help to prevent chronic degenerative diseases. The fruits are also high in potassium and help to establish a proper balance between the sodium and potassium content of our diets.

An often-neglected group, this group provides for the water-soluble vitamins and minerals, so vital for the proper functioning of the body's various mechanisms. These delicious natural capsules of vitamins and minerals offer protection against many diseases, especially, heart diseases and certain types of cancer. Most important is the fact that it offers a variety in terms of texture, colour and flavour and thus helps to avoid monotony in the meal.

Green leafy vegetables are rich sources of various nutrients such as iron, calcium, p-carotene, folic acid and vitamin C, the amount being much more in the darker leaves. Their contribution to energy intake is very low, usually less than 2-3%. Yellow-orange coloured vegetables are rich in p-carotene, as you may recall studying in Unit 7. They must therefore be included at least four to five times in our diets. We can say adding colour to our diet will add colour to our life.

The citrus fruits such as oranges, sweet-lime (mosambi) and also, papaya and guavas are rich in vitamin C and the yellow-orange ones such as mango and papaya are rich in p-carotene. Fruits with high water content such as melons have low energy content, while dry fruits such as dates and raisins are high in energy.

5) Fats, Oils and Sugar Group

This group imparts flavour to the items and thereby improves the palatability. Items incorporating them do melt in the mouth, it has been very aptly said '*a minute on the lips, forever on the hips*'.

The fats and oils are generally the most expensive among the dietary items and therefore intakes are determined by the economic affordability. A deficit in the intake of fats and oils is rare in the affluent population while an apparent surfeit in this group

is often responsible for obesity, heart ailments and certain types of cancers. Hence one needs to use caution in the amounts used.

Each of these groups provides some but not all of the nutrients. No single natural food supplies all the essential nutrients and the phytonutrients in proper proportions to maintain health, nor is a food group more important than the other. A meal plan that includes adequate amounts of foods from the different groups provides the foundation for good health which needs to be amply supported by food hygiene, clean drinking water and a clean environment.

Besides nutritional factors, the other factors affecting food choices are enumerated next.

12.3.2 Other Factors

Although people are aware and realize that their food choices affect their health, they often choose food for other reasons. Let us review these factors.

- *Personal Preferences:* Often people choose foods because they like certain flavours. While we Indians enjoy strong curry spices, the Western cuisine does not include them. Similarly, asafoetida (*hing*) features in the South Indian preparations while garam masala features in the North Indian cuisine.
- *Habit:* We often select food just out of habit. While *idli* and *dosa* feature in South Indian breakfast, *paranths* feature more commonly in the North Indian cuisine.
- *Social Interaction:* Food signifies friendliness. Meals are social events, and the sharing of food is a part of hospitality. Social customs almost compel people to accept food or drink offered by a host or shared by a group. When your friends are going out for pizza or ice cream, how can you refuse to go along?
- *Availability, Convenience and Economy:* People eat foods that are accessible, quick and easy to prepare, and within their financial means. Convenience is valued highly by the consumers, as reflected in their choices of meals they can quickly prepare the recipes with few ingredients. Many people frequently eat out or have food delivered, which limits food choices to the selections on the restaurant's menu.

Seasonal availability of food is particularly important aspect which influences the food choices, particularly for lower income group families.

- *Positive and Negative Associations:* People tend to like foods with happy associations – such as sweets during Diwali and cakes during Christmas. By the same token, we often develop intense dislike to foods that we have to eat when we are sick or when forced to eat when not hungry.
- *Emotional Comfort:* Some people eat in response to an emotional stimulus for e.g. to relieve boredom or depression or calm anxiety. A lonely person may choose to eat rather than to invite a friend and risk rejection. Eating in response to emotions can easily lead to over-eating and obesity but may be appropriate at times.
- *Body Image:* Sometimes, people select foods which they believe will improve their physical appearance and avoid those that may be detrimental. Such decisions can be beneficial when based on sound nutrition and fitness knowledge but undermine good health when based on faddism or carry to extremes.

Now that we have well-understood the factors that influence an individual's food choice, let us move on to discuss the concept of food exchange list. But first let us recapitulate what we have learnt so far.

Check Your Progress Exercise 1

1) What do you understand by the terms 'menu' and 'menu planning'? Why is menu planning considered an important activity in a food service organization?

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2) Justify the statement 'No single natural food is nutritionally complete.'

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3) Discuss the nutritional significance of:

a) Fruits and vegetables

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b) Pulses

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4) Enumerate the various factors affecting choice of food items.

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Now we move on to the study of exchange list and food composition tables.

12.4 EXCHANGE LIST VS. FOOD COMPOSITION TABLES FOR MENU PLANNING

A dietitian is frequently expected to make quick, yet reasonably accurate estimation of the nutritive value of diets or calculate diets that must be controlled for one or more nutrients. The nutritive value may be calculated from the Food Composition Tables (given in the Nutritive Value of Indian Foods by Gopalan et. al., NIN, Hyderabad).

By 1940s, dietitians and physicians were aware that Food Composition Tables used to calculate therapeutic diets were cumbersome, time-consuming and needlessly precise and that the dietitian does not have the time to calculate for each day the energy and nutrient composition of the food required to fulfill the dietary prescription. Thus, an *Exchange List* was evolved. What is the exchange list? It is *a grouping of foods in which specified amounts of all the foods provide approximately equal amount of (the same amount) carbohydrate, protein and fat and hence, energy content*. Specific foods within the group may vary slightly in nutritive value from the averages stated in the group. These differences in composition tend to cancel out because of the variety of foods selected from day to day. Thus, any food within a given list can be substituted or exchanged for any other food in that list in the given quantities.

Food exchange system allows one to choose a variety of foods with adequate nutrients. The food exchange system is important in planning a nutritious diet. Essentially, the *Food Exchange System* allows variety to be introduced into the diets without altering the energy or the macronutrient contents. The exchange lists are especially useful in planning diets for metabolic diseases and are very useful in the management of obesity.

Let us then quickly review the steps involved in planning/developing an exchange list. This will help you plan meals using the exchange list.

12.4.1 Steps in the Development of Exchange List

As mentioned above, when we group together similar food items so that each supplies a constant amount of a particular nutrient, we call the group a *food exchange*. Given herewith are the steps which when followed, will guide you in developing the exchange list. You will realize that developing an exchange list for Indian foods is a difficult task as our dishes defy any attempt at standardization. Nevertheless let us try.

- 1) An important first step in developing an exchange list is the standardization of serving or portion sizes. The portion sizes vary considerably in India. *Idlis, dosas, chapattis* and *puris* of different sizes in different states **and** in different households is a common scene. Despite this, some attempts have been made to define portion sizes.
- 2) The second step is to calculate the energy, carbohydrate, protein and fat content of one serving or portion size of the different dishes. This can be done by converting the cooked weight of one serving of a dish into raw weight of the ingredients that have gone into it. Although allowances should be made for cooking losses, this has not been done. Future exchange lists must **take** care of this. From the raw weights of the ingredients in one serving and using the Indian Food Composition tables, the energy, carbohydrate, protein and fat content of one serving can be calculated.
- 3) The third step is to create an exchange list of different dishes in **terms** of standard portion sizes that would provide approximately the **same** energy or carbohydrate or fat as the case may be. Since foods contain widely varying amount of the macronutrients, serving or portion sizes are defined for a group of more or less homogeneous foods. For example, all cereals provide approximately the same number of calories, approximately 350 per 100 g raw weight and about the same amount of carbohydrates, about 70 g per 100 g raw weight (Refer to Table 12.1). Therefore, cereal exchanges are grouped together. Similarly, there are vegetable, fruits, milk and meat exchanges. Within each of these food groups, the composition of the different items in terms of carbohydrate, protein and fats remain similar,

Table 12.1: Nutritive values used in the development of the exchange list for cereals

Food Group	Energy (Kcal)	CHO (g)	Protein (g)	Fat (g)
Bajra	361	67.5	11.6	5.0
Jowar	349	72.6	10.9	1.9
Maize, dry	342	66.2	11.1	3.6
Ragi	328	72.0	7.3	1.3
Rice, raw	345	78.2	6.8	0.5
Parboiled	346	79.0	6.4	0.4
Flakes	346	77.3	6.6	1.2
Puffed	325	73.6	7.5	0.1
WWF	341	69.4	12.1	1.7
Maida	348	73.9	11.0	0.9
Semolina	348	74.8	10.4	0.8
Vermicelli	352	78.3	8.7	0.4
<i>Mean</i>	344	73.5	9.1	1.5
Bread, White	245	51.9	7.8	0.7
Brown	244	49.0	8.8	1.4

- 4) An example is provided in Table 12.2 from a comprehensive exchange list developed by the Lady Irwin College. Another list, originally developed by the Dietary Department of CMC, Vellore and subsequently added to by many other institutions; consists of six exchange groups. These are cereals, pulses, milk, meat, fruits and vegetables A and B. A brief review of these exchanges follows:
- Cereal exchange per serving, provides 85 Kcals, 20 g carbohydrate and 1.6 g protein
 - Milk exchange provides per serving 65 Kcals, 4 g carbohydrate, 3 g protein and 4 g fat.
 - Meat exchange provides per serving 85 Kcals and varying amounts of CHO, protein and fat.
 - Fruit exchanges provide per serving 40 Kcals and 10 g carbohydrate.
 - The vegetable A group exchange provides 30 Kcals while the B group provides 30-50 Kcals.

Table 12.2: Food exchanges

Exchange (Food Group)	No. of Exchanges	Amount* (g)	Energy Content (Kcal)	Protein Content (g)
(Energy Giving group)				
Cereals	1	20	70	2
Roots and tubers	1	60	70	2
Sugar and Jaggery	1	5	20	-
Fats and oils	1	5	45	-
(Body-building group)				
Milk	1	250 ml	170	8
Pulses	1	30	100	7
Meat/fish/poultry/egg	1	40-50	70	7
(Protective/regulatory group)				
Green leafy	1	100	Negligible	Negligible
Vegetables	2 #	200	40	2
Other vegetables	1	100-150	40	2
Fruits	1	80-100	40	Negligible

*Basis of each exchange; cereals 15 g carbohydrate; roots and tubers 15 g carbohydrate; fats and oils 5 g fat; milk 8 g protein; meat/fish/poultry/egg 7 g protein; fruits 10 g carbohydrates.

- #2 exchanges of green leafy vegetables is equivalent to one exchange of other vegetables.

Source: Adapted from Comprehensive Exchange List developed by Lady Irwin College, Delhi.

Using the steps elaborated above, we hope you will be in a position to use the exchange system to calculate a diet pattern, which calculates the diet order in kinds and number of servings of food exchanges to be consumed by any individual or a patient each day.

Although the exchange system, you would have noticed, reflects average and not specific energy and nutrient values, the therapeutic success that results when the values are used to calculate the diet pattern demonstrate that the method is accurate enough to serve this purpose.

An adequate diet, providing all nutrients, is needed throughout our lives. An adequate and balanced diet is one that meets all the nutrient needs of an individual for maintenance, repair, the living processes, and growth or development. A balanced diet provides all the nutrients in required amounts and proper proportions. It can easily be achieved through maintaining variety in foods and including foods from the different food groups discussed above. The quantity of food needed to meet the nutrient requirements vary with age, gender, physical activity etc., as we will learn next, in the section focusing on planning for adults.

Before we proceed further, let us take a break and recapitulate what we have learnt so far by answering the check your progress exercise 2.

<p>Check Your Progress Exercise 2</p> <p>1) Define an exchange list.</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>2) What are the advantages of using exchange list in planning and calculating the nutritive value of a menu?</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>3) What are the limitations of using an exchange list in planning a menu?</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
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With a comprehensive understanding about food groups and exchanges, we shall now move on to planning for adults,

12.5 PLANNING FOR ADULTS

The term 'adult' refers to *any individual in the age group of twenty years and above*. The period beginning from twenty years and extending through old age till the time of death is considered the period of *adulthood*. Adulthood represents the stage in life when an individual has completed his/her growth in terms of body size. The nutritional need is for maintenance of body functions rather than for growth.

As an individual ages, there is a gradual and progressive change in body functioning. Why does this happen? This is because there is an increased breakdown of tissues and the renewal of worn out tissue is also much less. These changes associated with ageing are common to all individuals, but, there is a great variation from person to person. In some individuals, the changes become significant relatively early, whereas, in other cases these changes appear much later in adulthood. All these factors influence the nutrient needs of adults. We shall review the nutrient requirements for adults, next.

12.5.1 Recommended Dietary Allowances (RDA)

The recommended dietary allowances, are *estimates of nutrients to be consumed daily to ensure the requirements of all individuals are met in a given population*. You may recall studying about this concept and the RDAs earlier in Unit 1.

Growth is no longer an energy-demanding factor in adulthood as mentioned above, and BMR is relatively constant among population groups of a given age and gender. Consequently, habitual physical activity and body weight are the main determinants for the diversity in energy requirements, in particular for adult populations with different lifestyles. Table 12.3 presents the ICMR recommended dietary intakes of adults.

Table 12.3: Recommended dietary intakes for adults
MAN (Weight-60 kg)

Nutrient	Sedentary Work	Moderate Work	Heavy Work
Energy (Kcal)	2425	2875	3800
Proteins (g)	60	60	60
Calcium(mg)	400	400	400
Iron (mg)	28	28	28
Vitamin A (mcg)			
Retinol	600	600	600
Or			
β -carotene	2400	2400	2400
Thiamine (mg)	1.2	1.4	1.6
Riboflavin (mg)	1.4	1.6	1.9
Niacin (mg)	16	18	21
Ascorbic acid (mg)	40	40	40
Folic acid (mcg)	100	100	100
Vitamin B ₁₂ (mcg)	1	1	1

Nutrient	Sedentary Work	Moderate Work	Heavy Work
Energy (Kcal)	1875	2225	2925
Proteins (g)	50	50	50
Calcium (mg)	400	400	400
Iron (mg)	30	30	30
Vitamin A (mcg)			
Retinol	600	600	600
Or			
β-carotene	2400	2400	2400
Thiamine (mg)	0.9	1.1	1.2
Riboflavin (mg)	1.1	1.3	1.5
Niacin (mg)	12	14	21
Ascorbic acid (mg)	40	40	40
Folic acid (mcg)	100	100	100
Vitamin B ₁₂ (mcg)	1	1	1

Source: Nutrient Requirements and Recommended Dietary Intakes for Indians. ICMR, 1990.

In the Table 12.3, you would have 'noticed that:

- The nutrient requirements for adults are given under the three categories based on activity level – sedentary, moderate and heavy work, and
- The nutrient requirements for men and women are given separately. For computing RDA, the ICMR has taken body weight of 'reference man' as 60 kg and that of 'woman' as 50 kg.
- The requirements for proteins are based on body weight. The requirements are expressed as 1g protein per kg body weight.
- RDIs for thiamin, riboflavin and niacin are dependent on RDAs for energy. The relationship between the RDAs for these vitamins and energy, as also mentioned earlier in Unit 8 is as follows:

RDA for thiamin = 0.5 mg/1000 Kcal; RDA for riboflavin = 0.6 mg/ 1000 Kcal, RDA for niacin = 6.6 mg/1000 Kcal.

These recommendations given by ICMR are likely to be revised in the light of the new FAO/WHO human energy requirement report published recently in 2004. According to FAO/WHO, energy requirements for younger and older adults and the elderly should be calculated on the basis of physical activity level (PAL) as indicated in Table 12.4. In adult men and non-pregnant, non-lactating women, BMR times PAL is equal to total energy expenditure or the daily energy requirement.

Table 12.4: Classification of lifestyles in relation to the intensity of habitual physical activity, or PAL

Category	PAL value
Sedentary or light activity lifestyle	1.40 - 1.69
Active or moderately active lifestyle	1.70 - 1.99
Vigorous or vigorously active lifestyle	2.00 - 2.40*

* PAL values > 2.40 are difficult to maintain over a long period of time.

The examples of lifestyles with different levels of energy demands as given in Table 12.4 are enumerated herewith. You may also recall studying about these lifestyles earlier in Unit 2.

- *Sedentary or light activity lifestyles:* These people have occupations that do not demand much physical effort, are not required to walk long distances, generally use motor vehicles for transportation, do not exercise or participate in sports regularly, and spend most of their leisure time sitting or standing, with little body displacement (e.g. talking, reading, watching television, listening to the radio, using computers). One example is male/female teachers, office workers (executives, clerks, typists etc.) in urban areas, who only occasionally engage in physically demanding activities during or outside working hours. Another example are housewives living in urban areas, with access to energy saving devices and domestic help to carry out most of the manual chores and other moderate energy activities.
- *Active or moderately active lifestyles:* These people have occupations that are not strenuous in terms of energy demands, but involve more energy expenditure than that described for sedentary lifestyles. Alternatively, they can be people with sedentary occupations who regularly spend a certain amount of time in inoderate to vigorous physical activities, during either the obligatory or the discretionary part of their daily routine. For example, the daily performance of one hour (either continuous or in several bouts during the day) of moderate to vigorous exercise, such as jogging/running, cycling, aerobic dancing or various sports activities. Other examples of moderately active lifestyles are associated with occupations such as servants, house cleaners, masons and construction workers, or rural women in less developed traditional villages who participate in agricultural chores or walk long distances to fetch water and fuel wood.
- *Vigorous or vigorously active lifestyles:* These people engage regularly in strenuous work or in strenuous leisure activities for several hours. Examples are women with non-sedentary occupations who swim or dance an average of two hours each day, or non-mechanized agricultural labourers who work with a machete, hoe or axe for several hours daily and walk long distances over rugged terrains, often carrying heavy loads. Other examples of vigorously active occupations include rickshaw pullers, mine workers, coolies etc.

For FAO/WHO 2004 recoininendations for energy requirements, we suggest you look up Tables 2.11, 2.12, 2.13 and 2.14 given earlier in Unit 2 for men and women aged 18 to 29.9 years and 30 to 59.5 years, respectively. Tables 2.15 and 2.16 (in Unit 2) presents the recommendations for elderly male and female, respectively over 60 years.

Now that we have learnt about the nutrient requirements for the adult, let us focus our attention on how to translate these needs in terms of balanced diets/meals for adults.

12.5.2 Planning for Adults: Some Menu Plans and Dietary Guidelines

Now that we have a thorough and complete understanding about food exchange lists and the nutrient requirements for adults, we shall review a few regional menus and critically analyze them from nutritional point of view. But first, we would like you to study the dietary guidelines for Indians developed by National Institute of Nutrition (NIN), ICMR. These guidelines presented in Tables 12.5, 12.6 and Table 12.7 provide information as to the number of portions and actual diets that need to be consumed in order to ensure optimal health for Indian adult man and women. These diets, you would notice, are based on locally available foods within the reach of the people and generally are in conformity with our tradition and custom. Using these guidelines, we can plan diets for adults.

Table 12.5: Balanced diet for adults (Sedentary/Moderate/Heavy Activity): Number of portions

Food Groups	G/Portion	Type of Work					
		Sedentary		Moderate		Heavy	
		Man	Woman	Man	Woman	Man	Woman
Cereals & millets	30	14	10	16	12	23	16
Pulses	30	2	2	3	2.5	3	3
Milk	100 ml	3	3	3	3	3	3
Roots & tubers	100	2	1	2	1	2	2
Green Leafy vegetables	100	1	1	1	1	1	1
Other vegetables	100	1	1	1	1	1	1
Fruits	100	1	1	1	1	1	1
Sugar	5	5	4	8	5	11	9
Fats and Oils (visible)	5	4	4	7	6	11	8

For non-vegetarians substitute one pulse portion with one portion of egg/ meat/ chicken/ fish.

Source: Dietary Guidelines for Indians - A Manual. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad (1998).

Table 12.6: Sample meal plan for adult man (sedentary)

Meal Time	Food Group	Raw Amounts	Cooked Recipe	Servings
Breakfast	Milk	100 ml	Milk or	1/2 cup
	Sugar	15 g	Tea or	2 cups
			Coffee	1 cup
			Breakfast	
Lunch	Cereals	70 g		
	Pulses	20 g		
	Cereals	150 g	Rice	2 cups
			Chapati	2 nos.
	Pulses	20 g	Dal	1/2 cup
	Vegetables	150 g	Veg-curry	3/4 cup
	Vegetables	50 g	Veg. salad	7-8 slices
Tea	Milk	100 ml	Curd	1/2 cup
	Cereals	50 g	Snack	
	Milk	50 ml	Tea	1 cup
	Sugar	10 g		
Dinner	Cereals	150 g	Rice	2 cups
			Pulkas	2 Nos.
	Pulses	20 g	Dhal;	1/2 cup
	Vegetables	150 g	Veg curry	3/4 cup
	Milk (curd)	50 ml		1/2 cup
	Vegetables	50 g	Veg raita	1 medium
			Seasonal	
	Fruit	100 g		

1 cup = 200 ml

Note: For non-vegetarians - substitute one pulse portion with one portion of egg/meat/ chicken/fish Use 20 g visible fat per day.

Breakfast items: Idli- 4 Nos./ Dosa - 3 Nos. / Upma -1-1/2 cup/ Bread - 4 Slices/Porridge - 2 Cups/Corn flakes with milk - 2 cups

Snacks : Poha - 1 cup / Toast - 2 slices . Samosa - 2 / Sandwiches - 2 / Biscuits -5.

Source: Dietary Guidelines for Indians - A Manual. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad (1998).

Table 12.7: Sample meal plan for adult woman (sedentary)

Meal Time	Food Group	Raw Amounts	Cooked Recipe	Servings	
Breakfast	Milk	100 ml	Milk or	112 cup	
	Sugar	10 g	Tea or	2 cups	
			Coffee	1 cup	
			Breakfast		
Lunch	Cereals	50 g			
	Pulses	20 g			
	Cereals	100 g	Rice	1 cups	
			Chapati	2 nos.	
	Pulses	20 g	Dhal	112 cup	
	Vegetables	100 g	Veg-curry	112 cup	
Tea	Vegetables	50 g	Veg. salad	7-8 slices	
	Milk	100 ml	Curd	112 cup	
	Cereals	50 g	Snack		
	Milk	50 ml	Tea	1 cup	
	Sugar	10 g			
	Dinner	Cereals	100 g	Rice	2 cups
				Chapati	2 Nos.
Pulses		20 g	Dhal;	112 cup	
Vegetables		150 g	Veg curry	112 cup	
Milk (curd)		50 ml		112 cup	
Vegetables		50 g	Veg raita	1 medium	
Fruit		100 g	Seasonal		

1 Cup = 200 ml

Note: For Non-Vegetarians – Substitute one pulse portion with one portion of egg/meat/chicken/fish.

Use 20 g visible fat per day.

Breakfast items: Idli- 3 Nos./ Dosa – 2 Nos. / Upma –1 cup/ Bread – 3 Slices/ Porridge – 1-112 Cups/Corn flakes with milk – 1-112 cups

Snacks : Poha – 1 cup / Toast – 2 slices . Samosa – 2 / Sandwiches – 2 / Biscuits –5,

Source: Dietary Guidelines for Indians - A Manual. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad (1998).

Having studied the dietary guidelines, let us now review a typical South Indian Menu plan and critically analyze and give justification of the food items selected.

MENU (SOUTH INDIAN)

Breakfast

Ragi Kanji

Ragi

Milk

Sugar

Mid-morning

Rice flakes (roasted and sweetened)

Guava

Lunch

Rice

Roti

Dal

Aloo Palak, (Palak, Potato and Tomato)

Dry fish chutney

Tea

Lemon rice (with groundnuts)

Dinner

Pongal Rice

Mung dal

Drumstick leaves Bhaji

Put down your comments related to the menu in the space provided **herewith:**

Now compare your comments, with the justification presented herewith.

Justification of the plan:

- Ragi Kanji is given forms a good source of calcium in diet.
- Rice flakes forms one of fairly good sources of iron and to aid for good absorption of iron, Guava is given, which is one of the cheapest sources of vitamin C.
- Lunch has normal staple diet like rice, dal and roti which is accompanied by aloo palak (bhaji) – one of the sources of green leafy vegetable in diet and dry fish chutney, which forms a good source of protein.
- Lemon rice is given, which is typical to South Indian inenu and forms one of the sources of vitamin C. Lemon should be squeezed just before consumption to avoid oxidation of vitamin C. It also contains peanuts, which adds protein and calories to the diet.
- Pongal forms a good supplementation of protein through vegetarian sources due to mutual supplementation of rice and pulse, which completes the inadequacies of each other.
- Dinner also contains drumstick leaves chutney which forms one of sources of calcium. Curds form good source of protein.

Let us consider another typical North Indian Menu Plan and its justification from a nutritional standpoint. This menu is planned for a pregnant lady, who is anaemic, doing household chores and belongs to a low socio-economic groups, So let us proceed and find out what nutrients considered and which food items have been selected to fulfill the above listed criteria.

MENU (NORTH INDIAN)

Breakfast

Moong sprouts
Potato Parantha - Groundnuts, wheat flour, fat
Tea - Milk, sugar
Fruit - Sugar

Lunch

Bajra Roti (Bajra flour, fat)
Dal (Masoor dal, onion, tomato, fat)
Dry fish chutney
Vegetables (Yam, onion, tomato, french beans, fat)
Plain curds

Tea

Tea - Milk, sugar
Masala roti (Wheat flour, groundnuts)

Dinner

Plain rice
Dal (masoor dal, tomato, fat)
Vegetable (amaranth, potato, onion, tomato, fat)
Butter milk

Justification of the Plan:

The plan is for an anaemic pregnant lady, from a lower socio-economic level and doing moderate level of work, hence selection of foods is made accordingly.

- Among cereals, along with rice, whole wheat flour, some amount of Bajra is also incorporated to fulfill the iron requirements.
- Among pulses, as already to her low economic level, rationale for pulses is a bit restrictive. Hence, it has been made a point to incorporate sprouts to provide for some additional vitamins and minerals.
- There is also an accommodation made for nuts (groundnuts, being cheap) to meet her energy requirements along with calcium, iron, and protein.
- Milk is very important for her condition as milk is a very good source of calcium which is required in highest quantities.
- In flesh, dry fish has been incorporated, which is cheaper than other fish foods and at the same time, the best source of iron and calcium, which are the basic requirements of a pregnant woman.
- There is a need to give good amount of fruits and vegetables in the diet (increased need for vitamins, minerals, antioxidants, fibre). But looking at her socio-economic status, care has been taken to give her fruits/vegetables which are cheaper yet an enriched source of many nutrients.

We would finally end our study with tips on how to plan low cost menus.

12.5.3 Planning a Low Cost Menu

In this sub-section, you will find examples of a few low cost menus. We would like you to critically analyze these menu from the nutritional point of view. So go ahead and study these menus.

Menu I

Breakfast

Poha (with potato and moong sprouts)
Tea
Guava

Lunch

Chapati
Rice
Masoor dal
Yam Bhaji
Dry fish chutney
Cucumber raita

Tea

Ragi Porridge
Puffed rice and groundnut laddu
Papaya

Dinner

Bajra Bhakri
Dry fish chutney
Palak dal gravy
Buttermilk

So then what is your analysis? Compare your analysis with the analysis presented herewith.

Analysis

On analyzing of the menu, you would have noticed that:

- 1) Guava is served at breakfast containing rice flakes; vitamin C in guava will help in the absorption of iron (in rice flakes).
- 2) Ragi is given, which will supply calcium.
- 3) There is a combination of all the food groups at both lunch and dinner.
- 4) Dry fish is a cheap source of good quality protein, calcium and iron.
- 5) Raw foods in the form of raita and fruits are incorporated in the menu.

Let's look at another menu for a woman from a low socio-economic group.

Menu	Items
Breakfast	Bajra Bhakri, Colocasia leaves and potato bhaji Papaya Tea
Mid- morning	Sukha Bhel
Lunch	Roti Khichadi Dry fish chutney Aloo methi bhaji Pumpkin raita
Snacks	Rajgira Laddu Tea
Dinner	Roti Rice Dry fish chutney Aloo methi bhaji Cucumber raita

On critically analyzing the menu, you would observe that:

- Bajra used in the breakfast is a cheap and rich source of iron.
- Colocasia leaves are rich in iron, calcium, β -carotene and vitamin C.
- Papaya is an exceptionally rich source of β -carotene, besides being rich in vitamin C. The advantage of dry fish in a menu is already known to us.
- The menu for both lunch and dinner are almost same, and hence are ideally suited in the menu of the woman from the low socio-economic group.

With this, we end our study on planning diets for adults. Before we move on to the next unit, we would like to present another critical analysis on the nutritional profile of women in our country.

12.6 NUTRITION OF WOMEN

During the post-war years, the people in the developed world recognized that women were at a disadvantaged position and felt the need to improve their condition. The technical advances (such as birth control) and the labour-saving technological means (which helped to free the women from drudgery and gave adequate time for self-development) helped in the emancipation of women. The year 1975, known also as the "International Women's Year" was devoted to promote equality between men and women. The decade 1976-1985 is also designated as the United Nations Decade for Women: Equality, Development and Peace. In contrast to this, the majority of women in developing countries have inferior social status to men. They have less educational opportunities than men in the same society. The global literacy rates for adult female population are only 32% as against 52% for men; this gap is much wider in Asia and also Africa. Sex discrimination in nutrition and health care appears to increase the vulnerability of female children to infectious diseases. Female children receive less nutritional and health care with consequent higher mortality rate.

Women in many developing countries face social and cultural disadvantage in terms of health, nutrition, education and economic status compared to women in developed countries, as well as, men in their own societies. Half-a-million women die annually of causes related to delivery, and most of these are preventable. Maternal mortality rates are estimated as 8.74 per 1000 live births in rural Andhra Pradesh, India compared to 0.02 in Sweden. There are more deaths in India (from causes related to pregnancy and childbirth) in one week than there are in the whole of Europe in one year.

Child bearing in the third world involves a high risk of death. Maternal mortality accounts for almost 25% of deaths among women of child-bearing age in developing countries compared with 1% in the USA. According to WHO, up to 60 women die every hour worldwide due to problems associated with child birth. In the developing world as a whole, the life time risk of dying is 1 in 40 as compared to 1 in 40,000 in the developed world.

The World Health Organization estimates that 21 million low birth weight infants are born in the world each year and that a vast majority of such births occur in the third world. The incidence is around 17% in the developing countries compared to 7% in the industrialized world. Low birth weight is closely associated with maternal malnutrition; maternal malnutrition, especially in the last trimester of pregnancy, reduces the baby's ability to put on weight, a phenomenon which subsequently limits their chances for survival or growth.

Nutritional anaemia widely affects menstruating and pregnant women in the third world. The WHO estimates that nearly 500 million young women suffer from some degree of nutritional anaemia. It is alarming to know that almost one out of every two young women in the third world is likely to be anaemic. Iron deficiency has been identified as a common and important cause of nutritional anaemia in both pregnant and nonpregnant women in low-income populations which severely affects women's health and productivity. Anaemia is frequently caused by a combination of factors, particularly low iron intake and absorption, and is often aggravated by malaria and hookworm infestation.

Women's health and well-being in the low-income income families are seriously affected by too many pregnancies, prolonged lactation, long hours of work, poor diet repeated exposure to diseases and limited access to adequate health care.

The combination of work and reproduction exert substantial stress on women for many years in their lives. Repeated pregnancies and prolonged lactation often result in a physiological depletion and stress, while long hours of work put them under constant physical stress.

We all know that breastfeeding ensures adequate food and care for the infant. This demands that the mother should be ensured of special care which include besides adequate diet, reduction in her workload and knowledge of family planning options for adequate child spacing. This would ensure not only the mother's health but also her wellbeing; she needs to feel that she is as important as her infant.

There are several unique examples of successful nutrition intervention in almost every part of the world through the hard work of so many people. Thailand is one of them. Thai has been recognized by the nutrition community for its ability to eliminate severe and moderate malnutrition among children less than 5 yrs of age, and reduce overall malnutrition from 51% to about 19% within a decade. This was possible due to policies and programmes created to reduce poverty, as well as, malnutrition. Grounded with a primary health care philosophy, a good technical background and strong management skills, a group of academics and practitioners formed a core group for nutritional programme. This body helped merge nutrition work into the national poverty alleviation plan. The massive scale of implementation and high levels of volunteer recruitment at the village level, results were communicated widely and this helped to raise awareness. Both men and women were in nutrition policy implementation. These people acted individually and collectively to alert the public about nutrition problems and their burden for the nation's future. These leaders, from the very beginning realized that nutrition is not only a human disease, but a societal problem that can only be improved by collaborative efforts.

Also, Thai husbands are proud to leave decisions regarding household management, including family food and nutrition to their wives. This often includes money to be used in the family. With access to appropriate information, the women are decisive in nutritional matters and because of this background, women are key factors for nutrition in Thailand.

Gender-sensitive nutrition action is important for all Asian countries and it is especially significant for India. Systematic and concerted efforts are needed to create a critical mass of leaders – especially women leaders – who can understand the importance of this at various levels. As a professional trained to translate nutrition in terms of appropriate foods, you will be in a position to bring about changes in diet habits of people, particularly women – both the apparently healthy and the sick.

Check Your Progress Exercise 3

1) Fill in the blanks:

- a) The meals planed for an individual should be andadequate.
- b) A meal plan for a heavy worker would have more of rich foods.
- c) The protein requirement for adults are expressed as gm protein per kg body weight.
- d) The energy requirements for adults are based on the of an individual.
- e) Selecting the right kind of food in the'right and would help ensure balanced meals.

2) What *are* the two major aspects that must be kept in mind while *planning* meals for:

a) A rikshaw puller

.....
.....

b) A teacher

.....
.....

3) Plan a diet for adult male who leads a sedentary life-style.

.....
.....
.....
.....

4) Critically analyze the following dinner and lunch menus for a woman (working) of the low socio economic group from nutritional viewpoint

Dinner

- Chapati
- Tomato rice
- Rajma curry
- Carrot raita

.....
.....

Dinner

- Chapatis
- Masur dal
- Palak Amti
- Ladies finger bhaji

.....
.....

Lunch

- Vegetable Khichdi
- Tomato raita

.....
.....

12.7 LET US SUM UP

In this unit, we got introduced to the meaning of the term 'menu' and to the concept of menu planning. We saw the various benefits of menu planning and the nutritional and non-nutritional factors affecting people's food choices.

Further, to facilitate the process of menu planning, we learnt about food exchange lists and food composition tables. We also learnt the steps involved in the development of food exchange list and planning a few low cost menus along with its nutritional analysis, where we saw how meals must be planned for them based on the important nutrients, physical activity, gender and income level. Also, we got to have a look at a few sample menu plans along with their nutritional justification.

12.8 GLOSSARY

Balanced meal	:	a meal including different types of foods in such quantities and proportions that the need for calories, vitamins, minerals and other nutrients is adequately met.
Essential Amino Acids	:	amino acids that cannot be synthesized by our body and hence need to be supplied through diet.
Exchange list	:	a grouping of foods in which specified amount of all foods are of approximately equal proximate principles and energy content.
Food group	:	a number of food items sharing common characteristics.
Menu	:	a list of dishes planned for preparation.
Menu planning	:	planning of balanced meals that are colourful , appetizing , palatable and within the economic means.
Mutual supplementation	:	a nutritional strategy in which vegetable foods with low contents of amino acids are eaten together with a food that is high in that same amino acid.
Packed lunch	:	any food preparation carried to the place of work which is consumed in the afternoon.
Parboiling	:	to cook partially by boiling for a short period of time.
Satiety	:	a feeling of satisfaction and fullness after consuming meals.
Staple food	:	foods used frequently or daily, for example, rice (in the South) or wheat (in the North).
Texture	:	the structure, appearance, consistency of foods or food items. Crisp, smooth, soft, hard or chewy are some of the textures of the food.

12.9 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

- 1) Menu is a list of dishes planned for preparation and forms an essential part of all activities in the food service establishment. Menu Planning is a skilled activity involving planning of balanced meals that are colourful, appetizing, and palatable and within the economic means of the individuals concerned. It is essential to provide appetizing, nourishing and attractive meals to the people at a reasonable

price. It helps to determine quantities of different foods accurately. It helps to avoid monotony in the menus .

- 2) No single natural food supplies all essential nutrients in proper proportions to maintain health. Each of the food group i.e., cereals, pulses/meat and poultry, **milk** and **milk** products, vegetable fruit group and fats, oils and sugars provide specific nutrients. Hence food items from each of the food groups must be included in the diet to make it adequate.
- 3) a) These delicious natural capsules of vitamins and minerals offer protection against many diseases, especially, heart diseases and certain types of cancer. Green leafy vegetables are rich sources of various nutrients such as iron, calcium, β -carotene, folic acid and vitamin C, the amount being much more in the darker leaves. Yellow-orange coloured vegetables are rich in β -carotene. The citrus fruits such as oranges, sweet-lime (mosambi) and also, papaya and guavas are rich in vitamin C and the yellow-orange ones such as mango and papaya are rich in β -carotene. Fruits with high water content such as melons have low energy content, while dry fruits such as dates and raisins are rich in energy.
 - b) Pulses are rich sources of proteins (20-25 g/100 g), the limiting amino acid being methionine. They are fairly rich in iron, with soybean; cowpea, black gram and horse gram being exceptionally rich. Sprouting or germination of legumes, a practice common in our households, brings about beneficial effects.
- 4) The various factors which influence food choices include personal preferences, habits, social interaction, availability, convenience and economy, positive and negative associations, emotional comfort, body image. For details related to these factors, refer to section 12.3.'

Check Your Progress Exercise 2

- 1) An exchange list is a grouping of foods in which specified amounts of all the foods are of approximately equal (the same amount) carbohydrate, protein and fat and hence, energy content.
- 2) Food exchange system allows one to choose a variety of foods with adequate nutrients. The food exchange system is important in planning a nutritious diet. Essentially, the Food Exchange System can be used to select foods in familiar measures that are adequate in nutrient content and satisfy the requirements of a given individual.
- 3) The limitation of using the exchange list is that the exchange system reflects average and not specific energy and nutrient values.

Check Your Progress Exercise 3

- 1) a) well-balanced; nutritionally adequate
 - b) energy
 - c) 1
 - d) activity level
 - e) amount; proportion
- 2) a) A rickshaw puller performs heavy work. Hence, his energy requirements and requirements for other nutrients like the B-vitamins would be much more than of a sedentary worker. The day's diet must include more of energy- rich foods.
 - b) A teacher is a sedentary worker. Hence, the requirements of energy and other nutrients are much less as compared to a moderate worker. The day's diet must include calcium and iron-rich foods with normal intake of energy, as a high calories diet can lead to problems of weight gain etc.

3) This is an exercise for you. Try doing it yourself.

4) **Dinner**

- Chapati and rice are included in the menu, which provide with necessary calories, B vitamins and minerals. Adding tomato to rice makes it more colourful and appealing, as well as, provides β -carotene and vitamin C.
- Rajma curry, here provides proteins and calcium.
- Carrot Raita is a good source of both vitamin A and calcium and adds variety to the diet.

Dinner

- Chapati and pulse here provide a good source of calories, essential amino acids, minerals and vitamins.
- Inclusion of palak, a green leafy vegetable, in the menu improves the vitamin and mineral content of the menu.
- While instead of having two vegetables and pulse, pulse and palak combination along with lady's finger would have been preferable.

Lunch

Since lunch provides for vegetables, cereal and curd, it can be considered to be balanced, provided certain nuts (groundnuts) could be added to it.