

# **Practical Manual of Principles of Human Nutrition**

**Course No. FSN122**

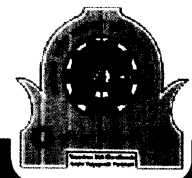
**II Semester B.Sc. (Hons.) Community Science**

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**CERTIFICATE**

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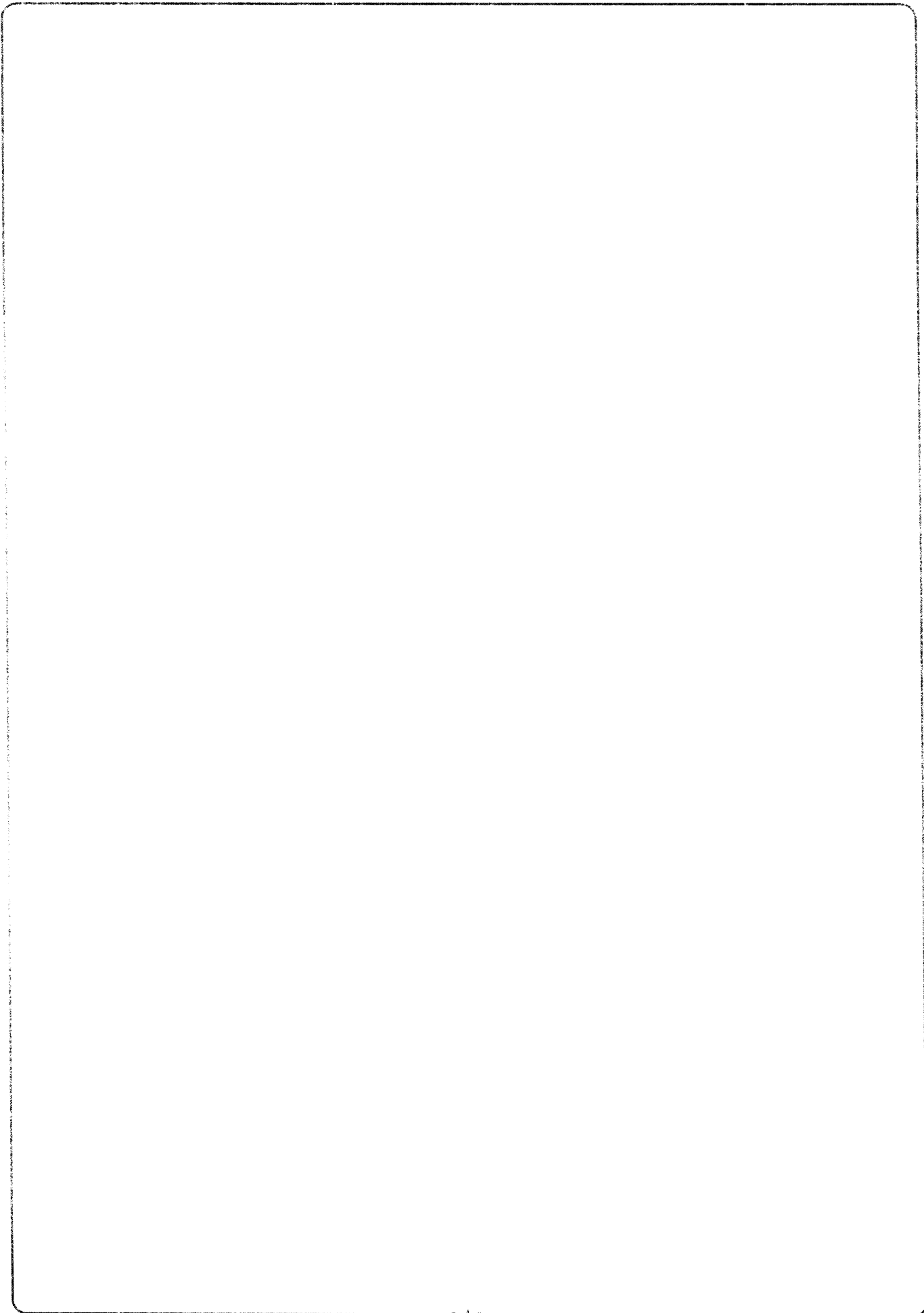
## Meal Planning

Diet form an important components of health and nutritional status of an individual, family or the community. Formulation of balanced diet for different population group is essential for proper maintenance of health and nutritional status. It is necessary to have adequate knowledge about nutritive value of food, nutrient requirement and skills for planning meal. While planning a meal, it is necessary to consider the socio-economic status, dietary habits and cultural constraints of an individual.

In order to provide daily requirement of energy and nutrients in right quantity and proportion through meals habitually consumed such as breakfast, lunch, dinner and snacks, appropriate meal planning is necessary. The practical tips that need to be followed in meal planning are as follows.

1. About one third days nutrient requirement be fulfilled in each of three main meals that are breakfast, lunch and dinner which are usually eaten. Approximate adjustment is made if snacks are consumed regularly.
2. At each meal, inclusion of variety of food is desirable.
3. Preparation should not be very spicy.
4. Use of raw vegetables i.e. salad and after ensuring their safety through proper washing or cleaning like grated carrots, cucumber, beetroot, onion and tomato etc. Sprouted grams (green-gram/Bengal gram) at meal time should be advocated.
5. Colour, texture and taste of dishes should be such that they impart a sense of pleasant and satisfaction.
6. Socio-economic and cultural factors that influence affordability (i.e. purchasing power of food by an individual, family and region) customs, traditional and food preferences should be kept in mind in planning menu.
7. Simple method of cooking like boiling, roasting, baking, shallow frying etc should be preferred.
8. Include many varieties of food. Include foods from each of five major food groups as to ensure adequate supply of energy and nutrients.
9. Ensure inclusion of adequate quantities of mixed cereal and pulses in diet. The ratio of pulses to cereals should be 1:7 or 1:8 in diet.
10. Vegetables and fruits being good sources of vitamins, minerals and fibers regular consumption should be ensured.
11. Milk is good source of protein and casein, vitamin A; Vitamin B2 should be included in vegetarian diet.
12. Fats and oils give energy value and reduce dietary bulk. So should be included in diet.

**Q.1 Plan a menu for sedentary worker (male).**



## Carbohydrates

Carbohydrates are a class of energy yielding substances which include starch, glucose, cane sugar, milk sugar etc. Grain foods, roots and tubers are largely composed of starch, a complex carbohydrate. Food ingredients like simple sugars namely; cane sugar and glucose are pure carbohydrates. Starch is a complex carbohydrate made up of glucose units. Glucose derived from starch and other sugar present in the diet is the main source of energy in the body. Carbohydrate derived from cereals form chief source of energy in Indian diets. Starches when eaten in a cooked form are completely digested in the gastrointestinal tract and the released glucose is absorbed and metabolized in the body to yield energy. Starches are almost completely utilized and there being no difference between starches derived from different sources.

Besides starch and other digestible carbohydrates mentioned above, many foods contain non-digestible carbohydrates like cellulose, hemi-cellulose, gums, pectins and lignins. These indigestible carbohydrates are designated as dietary fiber or "unavailable carbohydrates". These are not digested in the digestive tract and most of them are avoided as such and thus contribute to the bulk of the stools.

Though they do not contribute to the nutrient value of foods the presence of fiber i.e., roughage in the diet is necessary for mechanism of digestion and elimination of waste. The contraction of muscular wall of the digestive tract is stimulated by the fiber, thus counteracting the tendency to constipation. Lack of adequate fiber in diet containing refined foods, leads to constipation and colon cancer. Also some of the dietary fibres like gums, mucilages in our diets have been shown to lower blood cholesterol in hypercholesterolemic subjects and blood glucose in diabetes. Vegetables, particularly the leafy ones, fruits, condiments, spices and unrefined cereals are comparatively rich in fiber and a generous inclusion of these provides a diet rich in fiber.

In working out the diet schedule, the starch containing foods are included in adequate amounts to provide energy, paying adequate attention to dietary fiber to help bowel movement and obtain other desirable attributes. The daily diet of an adult should contain at least 40 g of dietary fiber. Most of the Indian diets provide daily this much of dietary fiber.

**Q. List out carbohydrate rich foods containing more than 50g carbohydrate per 100 g of food.**





## Energy Rich recipe

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**Q. Plan an energy rich recipe for a school going child (age 7 to 9yrs).**



## Proteins

Proteins are vital to any living organism. Proteins are the important constituents of tissues and cells of the body. Protein supply the body building materials and make good the loss that occludes to wear and tears. 1 gm proteins give 4 Kcal energy.

All foods except refined sugar, oil and fat contain protein to varying degree. Some foods contain a high amount of proteine animal foods like meat, fish, and egg, plant foods like pulses, nuts and oilseeds.

Soybean is the richest source containing over 40% protein. Milk is also good source of protein. The protein of cereal is deficient in lysine and protein of pulse has adequate lysine. So combination of cereals to pulses in the ratio of 7:1 has good nutritive value.

It is to be expected that children require more protein per unit body weight than to adult because of new tissues which are being laid down during growth from dietary proteins.

Likewise protein needs of women are greater during pregnancy and lactation than during non-pregnant and non-lactating state. The best source of animal protein for growing children is milk, milk also provide a good amount of calcium which is normally lacking in vegetarians diet. Egg also can be used as a source of good quality protein whenever possible.

Besides providing good quality protein, it provides a good amount of a wide range of other nutrient, particularly B<sub>12</sub> which is absent in vegetables, foods.

A judicious mixture of plant foods like cereals , pulses and vegetables can be relatively inexpensive and at same time nearly as good as amino acid pattern as that of expensive animal foods.

Deficiency of protein leads to protein calorie malnutrition (PCM) which can be cured by supplying high protein foods in daily diet.

**Q List out the protein rich foods containing more than 10g of protein per 100 gm of food.**



## Protein rich recipe

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Q1 Plan a protein rich recipe for preschool child (age 1 to 3 yrs).



**Q2 Plan a protein rich recipe for a sedentary working pregnant woman.**





## Calcium

Calcium is an essential element required for several life processes. As the structural component, calcium is required for the formation and maintenance of skeleton and teeth. It is also required for a number of other essential processes. It is required for normal contraction of heart for its normal function, nervous activity and blood clotting. These latter functions are carried out by ionized calcium present in the cells. The calcium levels in cells and plasma are well maintained. Calcium present in bones help to maintain the calcium level in plasma in the phase of dietary calcium deficiency.

Calcium is present in both animal and plant foods. The richest source of calcium among animal foods is milk and among the vegetables are green leafy vegetables. Among the leafy vegetables, amaranth, fenugreek and drumstick leaves are particularly rich in calcium and among root vegetables, tapioca is a good source.

Since there are no specific signs and symptoms attributable to calcium deficiency, the calcium requirement of man is not known with certainty. Moreover, man appears to adopt himself to low intake of calcium without any apparent deleterious effects. The currently recommended allowances for calcium should be considered only as tentative.

Based on the available information on retention of calcium by the human body in long term balance studies, the suggested level of intake for adult male and growing children is between 0.4 and 0.6 g/d. In the case of pregnant and lactating mother, the nutrition expert group of the Indian council of medical research has suggested a daily allowance of 1.0 g. In recommending these dietary allowances of calcium, the fact that part of calcium in cereal based diets is unavailable due to the presence of phytate and oxalic acid, has been taken into account.

Certain foods like leafy vegetables are rich in oxalates which bind calcium to form insoluble calcium oxalate and thus render calcium unavailable to the body.

Similarly, phytates present in whole cereals bind calcium. Other foods which contain oxalates are horse gram, gingelly seeds, tea and coffee, but in case of later beverages, only small amounts of oxalates pass in to infusion.

The habit of chewing betel leaves with slaked lime (calcium hydroxide), a practice quite common in India (particularly among the poor) can increase calcium intake. Calcium ingested in this way can be utilized by the body. The habit of chewing betel leaves with slaked lime several times a day by expecting and nursing mother in India has indeed a scientific basis.

**Q. List out the Calcium rich foods containing 200mg. of Calcium per 100 g of food.**





## Calcium rich recipe

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**Q. Plan a calcium rich recipe for sedentary worker lactating woman.**



## Iron

Iron is an essential element for the formation of haemoglobin of red cells of blood and plays an important role in the transport of oxygen. Tissues also require iron for various oxidation reduction reactions. Most of iron in body is reutilized and some of body iron is also stored in liver and spleen.

The amount of iron to be absorbed from daily diet is quite small. It is in the neighborhood of 1-3 mg dependent upon sex and physiological status. Since there is limited capacity to absorb dietary iron, diet should contain 10-25 fold iron required daily. Diets differ very widely in bioavailability of their iron. Diets predominantly based on cereals permit only a low level of absorption in the range of 2-5%, while diet containing low level of cereals and high level of meat and fish permit 10-20% absorption. The types of diet consumed normally in India should contain 20-30 mg iron to meet the iron requirement of an adult. In considering iron requirements, availability of iron from the composite diet is more important than from the individual foods because of profound interaction between foods in influencing iron absorption.

Rich sources of iron are cereals, millets, pulses, green leafy vegetables. Of the cereal grains and millets, bajra and ragi are very good source of iron. Since these grains are contaminated with dust etc., the true contents of these grains are often lower than the values obtained by analysis of the market samples. Contaminated iron, which is often not available at all, may constitute 20-30% of the total iron present in foods as purchased. Milk, a good source of several nutrients, is a poor source of iron. Inclusion in our daily diet about 50 gm of green leafy vegetables which are rich sources of iron can meet a fair proportion of iron needs besides providing calcium, carotene and vitamin C.

Although a diet rich in iron may be able to meet our daily iron requirement and prevent iron deficiency, they may not be effective in correcting iron deficiency anaemia as indicated by lowered level of haemoglobin in blood. Medicinal iron in the form of iron salts and other haematinics have to be provided to correct anaemia. Pregnant woman because of her high iron requirement often suffers from anemia even on a diet containing normal level of iron. In such cases, supplementation with iron salts may be essential at least during later half of pregnancy.

In view of widespread prevalence of iron deficiency anemia in many parts of the world, fortification of food with iron is advocated to prevent iron deficiency. In our country, fortification of common salt with iron has been successfully developed and demonstrated to be effective in preventing iron deficiency in the population, if regularly used in place of an ordinary salt.

**Q. List out Iron rich foods containing 5mg per 100g of foods.**





## Iron Rich Recipe

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Q. Plan an iron rich recipe for adolescent girl (age 16to17yrs).



## â-Carotene

Vitamin A is necessary for clear vision in dim light. Lack of vitamin A thus leads to night blindness. Another function of vitamin A is to maintain the integrity of epithelial tissues. Vitamin A or retinol is present in some animal food like butter and ghee, Whole milk, curd, egg, yolk, liver etc. The liver oils of certain fish like cod, halibut, and shark and saw fish are some of the richest known natural sources of vitamin. Vitamin A is not present as retinol in vegetable food. These foods contain yellow pigments called carotenes which are converted into vitamin A in the body. Carotenes are therefore termed pro-vitamin A.

The rich source of â-carotene is green leafy vegetables like spinach, amaranth, coriander, drumstick leaves, curry leaves, mint, radish leaves etc. Ripe yellow fruits such as mango, papaya, and tomatoes are also rich in carotene. Among other vegetables, carrot and yellow pumpkin are good sources. It can be said that in general, the greener the leafy vegetables, higher the content of carotene and thus the outer green leaves of cabbage have more carotene than inner white leaves. Most of the Indian diets have â-carotene as the main source of vitamin A. The availability of â-carotene from these diets vary from 25-50% depending on the fat content of diet.

Red palm oil (RPO) is also a very good source of â-carotene, besides being a source of edible oil. RPO is consumed as such in some African countries.

The concentrated source of vitamin A in our country is Shark liver oil and synthetic vitamin A. It is relevant at this stage to say a few words about shark liver oil industry in India. In the past, the only source of vitamin A for treatment of deficiency cases was the Norwegian cod liver oil and concentrates manufactured from halibut liver oil. Vitamin A deficiency which is common among the children of the poor in the country is public health problem leading to blindness. As an effective approach to prevent vitamin A deficiency among the children in rural areas, daily consumption of locally available inexpensive source of â-carotene is recommended. A proper and effective education of the mother in the use of carotene rich foods is essential to fight vitamin A deficiency. Green leafy vegetables like agathi, drumstick, spinach, amaranth and tomatoes, yellow pumpkin are some of the alternative that can be suggested. They can be consumed in amounts equivalent to 30-50 gm of GLV, 100 gm of mango, 200 gm of papaya etc. The advice given to the mothers should be practical and should emphasize the use of carotene rich foods locally available in different season and readily acceptable.

**Q1 List out Carotene rich foods containing more than 500 µg of carotene / 100g of food.**



**Q2. Plan a carotene rich recipe for an adolescent girl (age 16 to 17 yrs.).**



## Thiamine (Vitamin B<sub>1</sub>)

Vitamin B<sub>1</sub> or "thiamine" as it most commonly referred to, is an important member of the B-group of vitamins and is the first of the vitamins to be discovered. It was also known formerly as the "antiberi-beri" or "anti-neuritic" vitamin. Prolonged deficiency of thiamine in the diet is one of the main factors leading to the disease beri-beri which may manifest in one or the two forms. In the "dry beri-beri", there is loss of appetite, tingling and numbness in the legs and hands and a dropping of the feet. In "wet beri-beri" on the other hand, there is dropsy, palpitation and breathlessness and weakness of heart muscle leading to heart failure. Thiamine is concerned in the proper utilization of carbohydrates in the body and in the absence of adequate amounts of thiamine full utilization of sugars and starches for meeting the energy needs is adversely affected.

The richest source of thiamine is yeast and the outer layer of cereals like rice, wheat and millets. The commonly consumed foods which contain a high level of thiamine are unmilled cereals, pulses and nuts, particularly groundnuts. Fruits, vegetables and animal food like meat, fish, eggs and milk are poor sources of this vitamin. Thiamine is required for the metabolism of carbohydrates. Removal of outer bran of grains results in removal of thiamine and therefore diets largely based on highly milled raw rice contain insufficient thiamine and can cause beriberi.

Thiamine requirements are closely related to energy intake and hence its requirement is usually expressed in terms of energy intake and it is about 0.5 mg of thiamine/ 1000 Kcal



## Riboflavin (Vitamin B<sub>2</sub>)

Riboflavin as a part of a coenzyme is essential for several oxidation processes inside the cell and is concerned with energy and protein metabolism. Some of the clinical symptoms attributed to inadequate intake of this vitamin in the diet are the soreness of tongue (glossitis), cracking at the angles of the mouth (angular stomatitis), redness of the eye and burning sensation in the eyes, scaliness of the skin in the region between the nose and angles of the lips (seborrheic dermatitis). Scrotal dermatitis can also be a result of riboflavin deficiency. Recent studies indicate that psychomotor development in children may be impaired in riboflavin deficiency. Among the several B-complex vitamins, riboflavin deficiency is the most wide-spread, particularly among children and women in our country. Recent studies indicate that common infection like respiratory infections can accentuate the deficiency of riboflavin.

Good sources of Riboflavin are milk and milk products (including skim milk, butter milk, curds, cheese and whey), eggs, liver and green leafy vegetables. Wheat, millets, pulses are fair sources of riboflavin while rice, particularly is a poor source of riboflavin. Requirement of riboflavin is also related to energy intake in 0.6 mg/ 1000 kcal.

## Niacin

Niacin was properly identified in 1937 by Elevation. Niacin is white in color, bitter in taste, moderately soluble in hot water, very stable vitamin, measured in milligram. This vitamin can be formed in the body from the amino acid tryptophan, which is present in all dietary protein. Part of the dietary tryptophan is converted into niacin. 60 mg of this amino can give rise to 1 mg of niacin in the body. Hence, body requirement of this vitamin is partly by conversion from tryptophan present in dietary protein.

- \* **Deficiency of niacin:** Lack of this vitamin in the diet leads to disease pellagra, which is characterized by soreness of tongue, pigmented skin and diarrhoea.
- \* **Sources of Niacin :** Whole cereals, pulses, nuts and meat are good sources of nicotinic acid. Ground nut is particularly rich in nicotinic acid. Although poor in nicotinic acid, milk is also effective in preventing pellagra, because it is rich in tryptophan.

**Q. Plan a whole day menu for sedentary worker female. Calculate thiamine, riboflavin and niacin content of the menu.**





## Cynocobalamine (Vitamin B<sub>12</sub>)

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Vitamin B<sub>12</sub> is required for the maturation of cells and deficiency of this vitamin will result in megaloblasti canaemia. This vitamin is also required for proper functioning of the central nervous system and also required for the metabolism of folic acid. This vitamin is required for DNA synthesis.

The human requirement of the vitamin B<sub>12</sub> is 1 µg/ day. Vitamin B<sub>12</sub> is synthesized by bacteria and is present only in animal foods

**Q. List out vitamin B<sub>12</sub> rich foods.**



## Cynocobalamine (Vitamin B<sub>12</sub>)

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- Q. Plans a recipe for an adult male moderate worker containing vitamin B<sub>12</sub> rich foods.





**Q. Plan low cost nutritious whole day menu for sedentary worker male.  
Calculate energy, protein, iron and calcium content of the menu**



**Q. Plan low cost nutritious recipes from cereal, pulses, vegetables and fruits.**



**Q. Plan low cost nutritious recipes from nuts and oil seed, milk and milk products, meat and meat products.**