MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD PUNE.

SEMESTER END THEORY EXAMINATION

B.Sc. (Hons.) Horticulture

Semester	: III (NEW)	Academic Year	: 2019-20
Course No	: H/PHT 231	Title	: Fundamentals of Food Technology
Credits	: 2(1+1)		
Day & Date	:	Time	: Total Marks : 40

Note:
1. Solve ANY EIGHT from SECTION A
2. All questions from SECTION B are compulsory
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

MODEL ANSWER

Section A

Q.1. Explain any two moist cooking methods of food. Give its advantages and disadvantages

Answer: Heat may be transferred to the food during cooking by conduction, convection, radiation or by the energy or microwaves – electronic heat transfer. Water or steam and air or fat or combination of these is used as cooking media. Moist heat involves water and steam. Air or fat are used in dry heat. Foods can also be cooked by microwaves.

Explanation of any two methods

1. Boiling 1M

Boiling is cooking foods by just immersing them in water at 100°C and maintaining the water at that temperature till the food is tender. Foods that are cooked by boiling are rice, eggs, dhals, potatoes, meat, sago and beet root. Boiling can be done with excess of water (eggs, potatoes) or with sufficient water (dhal, upma). Boiling is generally used in combination with simmering or other methods, e.g. cooking rice, vegetables or dhal.

Advantages ½ M

It is the simplest method. It does not require special skill and equipment.
Soluble starches can be removed and rice grains are separated.
Protein gets denatured, starch gets gelatinized and collagen gets hydrolysed.
Uniform cooking can be done.

Disadvantages ½ M

Loss of nutrients: If excess water is used in cooking and the water is discarded 30-70% water soluble nutrients may be lost.

Loss of colour: Water soluble pigments, like betalains from beetroot may be lost.
Time consuming: Boiling may take time and fuel may get wasted.
Loss of flavour and texture: Boiled foods are not considered tasty because flavour compounds are leached into the water or volatile compounds gets evaporated. Over boiling leads to mashy product.

OR

2. Simmering **1M**

When foods are cooked in a pan with a well fitting lid at temperature just below the boiling point 82 – 92°C of the liquid in which they are immersed the process is known as simmering. It is a useful method when foods have to be cooked for a long time to make it tender as in the case of cheaper cuts of meat, fish, cooking custard, kheer, vegetables and carrot halwa. This method is also employed in making soups.

Advantages **½ M**

Foods get cooked thoroughly
Scorching or burning is prevented
Losses due to leaching is minimum

Disadvantages **½ M**

There is loss of heat sensitive nutrients, due to long period of cooking.
Takes more time and fuel.

OR

3. Poaching **1M**

This involves cooking in the minimum amount of liquid at a temperature of 80-85°C, that is below the boiling point. Foods generally poached are eggs, fish and fruits. For poaching eggs, the addition of little salt or vinegar to the cooking liquid lowers the temperature of coagulation. Eggs cook quickly by poaching.

Advantages **½ M**

Very quick method of cooking.
Easily digestible since no fat is used.

Disadvantages **½ M**

It is bland in taste.
Water soluble nutrients may be leached into the water.

OR

4. Stewing **1M**

This is a gentle method of cooking in a pan with a tight fitting lid, using small quantities of liquid to cover only half the food. The food above the liquid is cooked by the steam generated within the pan The liquid is brought to a boiling point and then the heat applied is reduced to maintain the cooking at simmering temperature ie. 98°C. Stewing is a slow method of cooking taking 2-4 hours depending upon the nature and volume of the foods being stewed. This method is generally used for cooking cheaper cuts of meat along with some root vegetables and legumes all put in the same cooking pot and cooked in stock or water. The larger cooking time and lower temperatures enable tougher meat fibres

to become soft. The cooking of meat and vegetables together make the dish attractive and nutritious since no liquid is discarded. Apples can also be cooked by this method.

Advantages ½ M

Retention of nutrients.

Flavor is retained e.g. in making Oondhya.

The vegetables are stewed by which flavour is retained.

Disadvantages ½ M

Time consuming.

OR

5. Steaming 1M

This method requires the food to be cooked in steam. This is generated from vigorously boiling water or liquid in a pan so that the food is completely surrounded by steam and not in contact with the water or liquid. Hence the food gets cooked at 100°C. Steaming is generally done in idli cooker.

Advantages ½ M

It does not require constant attention.

Nutritive value is maintained because there is no leaching and cooking time is less.

Easily digestible since not much fat is added. It is good for children and patients.

There is less chance for burning and scorching.

In double boilers sudden increase in temperature in making custards and overflow of milk can be avoided.

Texture of the food is better and becomes light and fluffy.

Steamed foods have good flavour.

Disadvantages ½ M

Special equipment is required.

Many foods cannot be prepared by this method. Eg. Rice

OR

6. Pressure cooking 1M

A relatively small increase in temperature can drastically reduce cooking time and this fact is utilized in pressure cooker. In pressure cooking, escaping steam is trapped and kept under pressure so that the temperature of the boiling water and steam can be raised above 100°C and reduce cooking time.

Advantages ½ M

It takes less time to cook.

Different items may be cooked at the same time.

Fuel is saved.

Requires less attention.

Nutrient or flavour loss may be less.

Food is cooked thoroughly by this method.

There is an indication for the completion of cooking.

There is less chances for scorching or burning.

Disadvantages ½ M

Thorough knowledge of using the equipment is required.

There may be mixing of flavours.

Foods may be undesirably soft.

Foods cooked in pressure cooker are rice, dhal, vegetables and meat.

Q.2. Define food. Describe any one food group

Answer: Food is that which nourishes the body. Food may also be defined as anything eaten or drunk, which can be absorbed by the body to be used as an energy source, building, regulating or protective material. In short, food is the raw material from which our body is made. Intake of the right kinds and amounts of foods can ensure good health, which may be evident in our appearance, efficiency and emotional well being. 1M

Explanation of any <u>one food group</u> 3 marks

The 4-Food Group plan 3M

S.No	FOOD GROUP	NUTRIENTS
1.	**Milk group** Milk, cheese, ice cream (cheese and ice cream can replace part milk)	Calcium, Phosphorus, Proteins and Vitamins.
2.	**Meat group** Beef, veal, pork, lamb, poultry, fish,eggs	Proteins, Phosphorus, Ironand B-Vitamins
3.	**Vegetable-fruit group**	Vitamins, Minerals and Fibre
4.	**Broad-Cereals group** (Whole grain, enriched, restored)	Thiamine (B_1), Niacin (B_5) Riboflavin, Iron, Carbohydrates and Fibre.

OR

The 5-Food Group plan (Nutrition Expert Group, I.C.M.R.)

The nutrition expert group of Indian Council of Medical Research, India suggested a five food group plan and the nutrients supplied by each food group are given in Table.

S.No	Food group	Nutrients
1.	Protein group This includes protein rich foods such aspulses, nuts, milk, meat, fish, eggs etc.	Rich sources of proteins, minerals and Vitamins.
2.	Fruits and green leafy vegetables Papaya, Orange, Mango, Indian gooseberry, Guava etc., and all green leafy vegetables.	Fair sources of certain vitamins, minerals
3.	Other vegetables Beans, Brinjal, Lady finger etc.	Fair sources of certain vitamins, minerals and fibre

4.	Cereals, roots and tubers, Rice, Wheat, maize, ragi, pearl millet etc. potato, tapioca, sweet potato. etc.	Rich sources of starch-fair to good sources of proteins and certain B-Vitamins.
5.	Fats and oils and pure carbohydrate foods Vegetable oils, animal fats, sugar, jaggery, honey, sago, custard powder, starch, etc.	Rich sources of energy, Vegetable oils are fair sources of essential fatty acids (EFA) and vitamin E. Butter is the good source ofVitamin A. Animal fats are rich in cholesterol but poor sources of EFA and Vitamin E. Pure carbohydrate foods – rich sources of energy.

OR

The 7-Food Group plan

The 7- food group plan was developed by the U.S. Department of Agriculture in 1943. The 7 groups together with their nutrient contribution are given in table.

S.No	Food groups	Nutrients contributed
1.	Green and yellow vegetables	β Carotene (Provitamin A), Ascorbic acid (vitamin C) and iron
2.	Oranges, grape fruits, tomatoes or raw cabbage or salad greens	Ascorbic acid and lycopene
3.	Potatoes, other vegetables and fruits	Vitamins, minerals and fibre
4.	Milk and milk products	Calcium, Phosphorus, Proteins and Vitamins
5.	Meat, Poultry, fish and egg	Proteins, Phosphorus, Iron and B-Vitamins
6.	Bread, Flour and cereal (Whole grain, enriched or restored)	Thiamine, Niacin, Riboflavin, Iron, Carbohydrate and Fibre.
7.	Butter or fortified margarine	Vitamin A and Fat

OR

11-food group plan

The 11-food group plan was suggested by the U.S. Department of Agriculture in 1964. The foods in each of the 11 groups are given in table.

S.No	Food group
1.	Cereals and millets
2.	Pulses
3.	Nuts and oil seeds

4.	Vegetables
5.	Fruits
6.	Milk and milk products
7.	Eggs
8.	Meat, fish and other animal foods
9.	Fats and oils
10.	Sugar and other carbohydrate foods
11.	Spices and condiments

Q.3. Differentiate between well and malnourished population.

Answer: Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients.

Any 8 differences ½ mark for each difference

Sr. No	Criteria	Well nourished child	Malnourished child
1.	Hair	Bright, black, shiny and glossy	Brown, sparse and thin
2.	Ear	Clear, free from discharge	Infected running ear
3.	Eyes	Bright with clear vision	Poor vision, Infected eye
4.	Nose	Clear, free from any discharge	Running nose
5.	Mouth	Bright, without any infection	Sores (Angular stomatitis at the corners of the mouth)
6.	Teeth	Regular, without any decay	Irregular with decayed teeth
7.	Gums	Bright, healthy looking	Bleeding or swollen gum
8.	Position of the head	Straight looking	Mal functioning
9.	Shoulders	Erect	Mal formation or irregular
10.	Hands/ Nails	Bright, pink in colour	Spoon shaped nails, cracked nails
11.	Abdomen	Regular	Protruding belly
12.	Legs	Straight	Bow legs, knock knees

Q.4. What do you mean by nutritional assessment? Explain any one method of nutritional assessment

Answer: Nutritional assessment is the interpretation of anthropometric, biochemical (laboratory), clinical and dietary data to determine whether a person or groups of people are well nourished or malnourished (over-nourished or under-nourished). 1M

Nutritional assessment can be done using the ABCD methods. These refer to the following:

A. **Anthropometry:** To assess growth in children you can use several different measurements including length, height, weight and head circumference. **3M**

1. Length : A wooden measuring board (also called sliding board) is used for measuring the length of children under two years old to the nearest millimetre. Measuring the child lying down always gives readings greater than the child's actual height by 1-2 cm.

2. Height: This is measured with the child or adult in a standing position (usually children who are two years old or more). The head should be in the Frankfurt position (a position where the line passing from the external ear hole to the lower eye lid is parallel to the floor) during measurement, and the shoulders, buttocks and the heels should touch the vertical stand. Either a stadiometer or a portable anthropometer can be used for measuring. Measurements are recorded to the nearest millimetre.

3. Weight: A weighing sling (spring balance), also called the 'Salter Scale' is used for measuring the weight of children under two years old, to the nearest 0.1 kg. In adults and children over two years a beam balance is used and the measurement is also to the nearest 0.1 kg. In both cases a digital electronic scale can be used if you have one available. Do not forget to re-adjust the scale to zero before each weighing. You also need to check whether your scale is measuring correctly by weighing an object of known weight.

4. Head circumference: The head circumference (HC) is the measurement of the head along the supra orbital ridge (forehead) anteriorly and occipital prominence (the prominent area on the back part of the head) posteriorly. It is measured to the nearest millimetre using flexible, non-stretchable measuring tape around 0.6cm wide. HC is useful in assessing chronic nutritional problems in children under two years old as the brain grows faster during the first two years of life. But, after two years the growth of the brain is more sluggish and HC is not useful. In Ethiopia, HC is measured at birth for all newborn babies.

5. Measuring fat-free mass (muscle mass): An accurate way to measure fat-free mass is to measure the Mid Upper Arm Circumference (MUAC). The MUAC is the circumference of the upper arm at the midway between the shoulder tip and the elbow tip on the left arm. The mid-arm point is determined by measuring the distance from the shoulder tip to the elbow and dividing it by two. A low reading indicates a loss of muscle mass.

OR

B. **Biochemical/biophysical methods:** The blood tests conducted within a nutrition assessment are interpreted in conjunction with a clinical examination; previous medical history; and current medications. Biochemistry tests measure levels of chemical substances present in the blood. Functional tests measure the function of vital organs such as the kidneys or liver. This assessment

involves assessment of Protein, Vitamin A, Vitamin B (Thiamin, Riboflavin, Niacin, and Acid), Vitamin C, Vitamin B12, Iron and Iodine. 3M

OR

C. Clinical methods: Clinical methods of assessing nutritional status involve checking signs of deficiency at specific places on the body or asking the patient whether they have any symptoms that might suggest nutrient deficiency from the patient. Clinical signs of nutrient deficiency include: pallor (on the palm of the hand or the conjunctiva of the eye), Bitot's spots on the eyes, pitting oedema, goitre and severe visible wasting.

1. Checking for bilateral pitting oedema in a child: In order to determine the presence of oedema, you should apply normal thumb pressure on both feet for three seconds (count the numbers 101, 102, 103 in order to estimate three seconds without using a watch). If a shallow print persists on both feet, then the child has nutritional oedema (pitting oedema). You must test for oedema with finger pressure because you cannot tell by just looking.

2. Bitot's spots: These are a sign of vitamin A deficiency. These spots are a creamy colour and appear on the white of the eye.

3. Goitre: Goitre is a swelling on the neck and is the only visible sign of iodine deficiency.

4. Visible severe wasting : In order to determine the presence of visible severe wasting for children younger than six months, you will need to ask the mother to remove all of the child's clothing so you can look at the arms, thighs and buttocks for loss of muscle bulk. Sagging skin and buttocks indicates visible severe wasting

5. General appearance and behaviour– Short Statured, Under Weight, Easily fatigued, Listless, Apathetic, Cathexis, Depressed, Nervous, Irritable, Inability to concentrate, Poor work capacity, Insomnia, polar, etc. are the major general signs of nutritionally unfit.

6. Hair- If the hair are thin and sparse, dry and brittle, easily pluckable, dyspigmented, flag signs, then the person is malnourished.

7. Face- Diffuse Depigmentation, Nasolabial Dyssebacia, Moon face, monkey face is common signs of malnutrition.

3M

OR

D. Dietary methods: Intake of calories, proteins and other nutrients. Studies of dietary habits. Estimate Basal Metabolic Rate (BMR) using Henry Equations (2005) based on age, gender and weight (Henry, 2005) or estimate requirements for stable patients using 25-35kcal/kg. Fluid

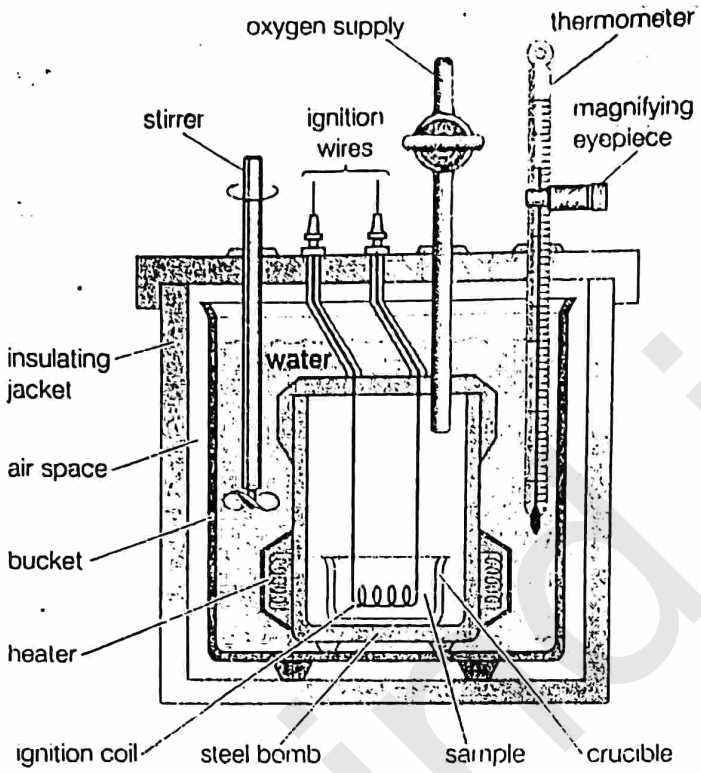
requirements: Aged >60 years = 30ml/kg body weight. Aged <60 years = 35ml/kg body weight **3M**

Q.5. Elaborate the term energy value of food. Explain determination of energy value of food using bomb calorimeter.

Answer: Energy Value : The energy or calorific value of foods depends on the quantity of carbohydrates, fats and proteins present in them. The energy value of foods can be expressed in terms of Kilo calories (Kcal) or Mega Joules (MJ). The Unit 'Kilo Calorie' is in use now. **1M**

The energy value of foods is usually determined using the instrument called bomb calorimeter. It consists of a heavy steel bomb, with a platinum or gold-plated copper lining and a cover held tightly in place by means of a strong screw collar. A weighed amount of sample, usually pressed into pellet form, is placed in a capsule within the bomb which is then closed except for the oxygen valve, charged with oxygen to a pressure of about 300 pounds to a square inch. The oxygen valve is then closed and the bomb immersed in a weighed amount of water. The water is constantly stirred and its temperature is taken at intervals of one minute by means of a differential thermometer, capable of being read to one thousandth of a degree. After the temperature of the water has been determined, the sample is ignited by means of an electric fuse. On account of the large amount of oxygen present; it undergoes rapid and complete combustion and generates heat. The heat liberated is absorbed by the water in which the bomb is immersed resulting in rise in temperature which is accurately determined.

The thermometer readings are also continued through an 'after period', in order that the 'radiation correction' may be calculated and the observed rise of temperature corrected accordingly. This corrected rise, multiplied by the total heat capacity of the apparatus and the water in which it is immersed, gives the total heat liberated in the bomb. From this, the heat arising from accessory combustions (the oxidation of the iron wire used as a fuse etc.) must be deducted to obtain the number of calories arising from the combustion of the sample. **2M**



The amount of energy release from the nutrients in bomb calorimeter or oxy calorimeter is known as gross fuel value. 1 g carbohydrate 4.1 Kcal, 1 g fat 9.45 Kcal, 1 g protein 5.65 Kcal 1M

Example:

Wt. of wheat taken = 2g.

Wt. of water in the outside vessel =3,000g.

Water equivalent of the calorimeter =500g.

Initial temperature of water =240 C

Final temperature of water = 260 C

Rise in temperature = 20 C

Heat gained by water and calorimeter = 3,500 x 2 =7,000 small calories or 7 Kcal.

2 g. wheat produces 7 Kcal.

1 g. wheat produces 3.5 Kcal.

Calorific value of 100 g. of wheat = 350 Kcal

Q.6. Write short note on (ANY TWO)

a. Over and under nutrition

Answer: Over Nutrition: Over nutrition is defined as the overconsumption of nutrients and food to the point at which health is adversely affected. Over nutrition can develop into obesity, which increases the risk of serious health conditions, including cardiovascular disease, hypertension, cancer, and type-2 diabetes. ½ M

Causes: Obesity and overweight result from a variety of causes included individual behavioral and genetic causes. While many factors including genetics, drugs, and other medical conditions may contribute to obesity, behavior is perhaps the most common contributor. Individual level healthy weight is associated with a healthy diet and regular physical activity. Restaurants are serving incredibly caloric meals, with some meals containing 2,000 calories. People are becoming more sedentary in both the home and office. ½ M

Prevention: Five different methods are used for the treatment of obesity: Diet, psychotherapy, Modification of physical activity, Pharmacotherapy, surgery.

Under Nutrition: The three key under nutrition measures – underweight (defined as inadequate weight for age), stunting (defined as inadequate length/height for age) and wasting (low weight for height) – stunting best reflects the cumulative effects of child under nutrition and infection during the critical 1000-day period covering pregnancy and the first two years of a child's life. ½ M

Causes: Diet problems, psychological problems, digestive complaints and stomach conditions. lack of food, high food prices and lack of breastfeeding all the main causes of malnutrition. The main causes of malnutrltion include changes in nutrient requirements, secondary to disease processes and drug modalities in combination with low or marginal dietary intake. Infections are common and result in anorexia, poor dietary intake, and malnutrition, which predispose the patient to another infection. ½ M

Prevention: It is necessary for a person to avoid malnutrition and also to use all those food ingredients or healthy diet which promote his/her health. Healthy diet include to use Plenty of fruit and vegetables Plenty of bread, rice, potatoes, pasta and other starchy foods Milk and dairy foods Meat, fish, eggs, beans and other non-dairy sources of protein.

b. Physiological function of food

Answer: The Physiological functions: To provide energy, To repair body tissues, To build new cells and tissues, To regulate body processes, To protect against diseases.

To provide energy : Body needs fuel for voluntary and involuntary activities., Carbohydrate and fat rich foods are main sources, Carbohydrate are starch, sugars and cellulose. Fat sources are vanaspati, butter, ghee, nuts and oil seeds- 1 gram of carbohydrate yields 4 kilocalories, 1 gram of fat yields 9 kilocalories, 1 gram of protein yields 4 kilocalories. ½ M

To repair and build new body tissues: Proteins, water and minerals build cells, muscles and blood. Protein sources are cereals and pulses. Animal protein comes from milk products eggs,

fish and meat. Body tissues are continually broken down and replaced by new ones. Protein, minerals and water are required to replace them. ½ M

To regulate body processes: Essential fatty acids present in certain fats, proteins, minerals, vitamins and water all perform certain regulatory functions – coagulation of blood, maintenance of body temperature, activation of enzymes etc. ½ M

To protect against diseases: Vitamins and minerals protect body from injury and diseases. They help in regulating growth, muscular co-ordination, eye sight, digestion and other body processes. These are present in green leafy vegetables, other vegetables, milk, meat, liver and eggs etc. ½ M

c. Sources and Functions of phosphorus.

Answer: Sources: Phosphorus is found in high amounts in protein foods such as milk and milk products and meat and alternatives, such as beans, lentils and nuts. Grains, especially whole grains provide phosphorus. Phosphorus is found in smaller amounts in vegetables and fruit. Dairy products such as milk, cheese, custard, cottage cheese, yogurt, ice cream, pudding Nuts, seeds, peanut butter, Dried beans and peas such as baked beans, black, beans, chick peas, garbanzo beans, kidney, beans, lentils, limas, northern beans, pork and beans, split peas and soybeans, Bran cereals, whole grain products, Beverages such as cocoa, ale, beer, chocolate drinks, and dark cola drinks 1M

Functions of Phosphorus: The main function of phosphorus is in the formation of bones and teeth. It plays an important role in how the body uses carbohydrates and fats. It is also needed for the body to make protein for the growth, maintenance, and repair of cells and tissues. Phosphorus also helps the body make ATP, a molecule the body uses to store energy. Phosphorus works with the B vitamins. It also helps with the Kidney function, Muscle contractions, Normal heartbeat, Nerve signaling 1M

Q.7. What is mineral nutrition? Explain Calcium and Iron with respect to sources, functions and deficiencies.

Answer: Sources of Calcium: Dairy products. Low-fat milk, yogurt, cheese, and cottage cheese are good sources of calcium. Veggies, broccoli and dark green, leafy vegetables Soy foods. Like soy milk, tempeh, soy yogurt, and cooked soybeans. Calcium-fortified foods like for calcium-fortified orange juice, soy or rice milk, breads, and cereal. Beans like baked beans, navy beans, white beans, and others. Canned fish like sardines and canned salmon with bones. Almond milk. ½ M

Functions of Calcium: Calcium is necessary for several physiological processes including neuromuscular transmission, smooth and skeletal muscle contraction, cardiac automaticity, nerve function, cell division and movement, and certain oxidative processes. It is also a co-factor

for many steps during blood coagulation; Calcium is also involved in the action of other intracellular messengers. Release of neurotransmitters and hormones. ½ M

Deficiencies of Calcium: Dietary calcium deficiency is a condition in which there is an inadequate calcium intake, which can lead to depleted calcium stores in the bones, thinning and weakening of the bones, and osteoporosis. Hypocalcemia is a low level of calcium in the blood. It can occur from taking medications, such as diuretics; medical treatments; or disease processes, such as renal failure or hypo-parathyroidism 1M

Sources of Iron: Eggs, Breakfast cereals, Pulses and beans baked beans, chickpeas and lentils, Nuts and seeds, Brown rice, Tofu, Bread, especially wholemeal or brown bread, Leafy green vegetables, especially curly kale and broccoli, Dried fruit in particular dried apricots, raisins and prunes Lean red meat, Turkey and chicken, Liver is rich in iron, Fish, particularly oily fish which can be frozen or canned (such as mackerel, sardines and pilchards). ½ M

Functions of Iron: Iron has several vital functions in the body. It serves as a carrier of oxygen to the tissues from the lungs by red blood cell haemoglobin, as a transport medium for electrons within cells, and as an integrated part of important enzyme systems in various tissues. Several iron-containing enzymes, the cytochromes act as electron carriers within the cell and their structures do not permit reversible loading and unloading of oxygen. Other key functions for the iron-containing enzymes include the synthesis of steroid hormones and bile acids; detoxification of foreign substances in the liver; and signal controlling in some neurotransmitters, such as the dopamine and serotonin systems in the brain. The primary function of hemoglobin (Hb) is to transport oxygen. ½ M

Deficiencies of Iron: Anemia occurs when you have a decreased level of hemoglobin in your red blood cells (RBCs). Hemoglobin is the protein in your RBCs that is responsible for carrying oxygen to your tissues. Iron deficiency anemia is the most common type of anemia, and it occurs when your body doesn't have enough of the mineral iron. Your body needs iron to make hemoglobin. When there isn't enough iron in your blood stream, the rest of your body can't get the amount of oxygen it needs. decreased memory, impaired learning and concentration, impaired immune function; decreased aerobic sports performance, fatigue, adverse pregnancy outcomes: risk of premature, delivery and low birth weight baby, infant motor and mental function delay which can last into young adulthood. 1M

Q.8. Define balanced diet. Give the RDA for pregnant and lactating women

Answer: Balanced Diet: A balanced diet is a diet that contains an adequate quantity of the nutrients that we require in a day. A balanced diet includes six main nutrients, i.e. Fats, Protein, Carbohydrates, Fibre, Vitamins, and Minerals. ½ M

A sedentary woman requires 1875 calories per day. Additionally 300 calories are required during pregnancy. That is a total of 2175 calories. A sedentary woman requires 1 gram protein per kg body weight per day- that is a total of 50 grams if the woman prepregnant weight is 50kg. Additionally, she requires 0.3 grams per kg body weight during pregnancy. That is, a total of 65 grams protein is required per day if the prepregnant weight is 50 kg. Daily oral iron and folic acid supplementation is recommended as part of the antenatal care to reduce the risk of low birth weight, maternal anaemia and iron deficiency. Iron is needed for haemoglobin synthesis, mental function and body defence. Deficiency of iron leads to anaemia. Plant foods like legumes and dried fruits contain iron. Folic acid, taken throughout the pregnancy, reduces the risk of congenital malformations and increases the birth weight. Green leafy vegetables, legumes, nuts and liver are good sources of folic acid. 500 mg folic acid supplementation is advised preconceptionally and throughout Pregnancy for women with history of congenital anomalies (neural tube defects, Cleft palate) Calcium is essential, both during pregnancy and lactation, for proper formation of bones and teeth of the offspring and for secretion of breast-milk rich in calcium and also to prevent osteoporosis in the mother. Iodine intake ensures proper mental health of the growing foetus and infant. 1M

Table no: 1 Recommended daily dietary allowances for pregnant and lactating women $2^{1/2}$ M

Nutrient	Pregnant*	Lactation*
Vitamin A (µg/d)	770	1300
Vitamin D (µg/d)	15	15
Vitamin E (mg/d)	15	19
Vitamin K (µg/d)	90	90
Folate (µg/d)	600	500
Niacin (mg/d)	18	17
Riboflavin (mg/d)	1.4	1.6
Thiamin (mg/d)	1.4	1.4
Vitamin B_6 (mg/d)	1.9	2
Vitamin B_{12} (µg/d)	2.6	2.8
Vitamin C (mg/d)	85	120
Calcium (mg/d)	1,000	1,000
Iron (mg/d)	27	9
Phosphorus (mg/d)	700	700
Selenium (µg/d)	60	70
Zinc (mg/d)	11	12

*Applies to women >18 years old

Q.9. Describe the effects of cooking on food nutrients.

Answer: A number of changes occur in food during its preparation. To obtain acceptable food products, it is necessary to understand and manipulate these changes. Basically, the change is the net result of the changes of various components of food viz. its nutrients like carbohydrates, fats, proteins, their derivatives and water. In addition changes occur due to various inorganic, mineral components and a number of pigments, flavour components, vitamins, acids, enzymes etc.

Carbohydrates: Starch, sugar, gums, cellulose are important carbohydrate found in foods. On cooking the starch granules in foods swell as they absorb water. This process is called gelatinization and is in fact the reason for the thickening of soups, curries, stews to which corn flour paste is added. Gelatinization takes place in all starch containing foods such as potatoes on heating in the presence of moisture. Dry heat causes the starch to break down into smaller molecules called dextrins. For example, in the toasting of bread or making of chapattis or rotis. Dextrins have a mildly sweet flavour. Sugar on heating from syrup with water. On further cooking syrup thickens and changes colour. This is due to a process called caramelization. The brown, thick liquid formed is called caramel and is used in a number of preparations such as custard, cakes. Ordinary cooking causes little loss of carbohydrates. Celluose is not digested by humans but becomes softer on cooking and is helpful in smooth movement of food through digestive tract. **1M**

Proteins: Proteins harden and solidify or coagulate on cooking. The liquid sets on heating and becomes solid. This is the process of coagulation. However, milk protein is an exception. Unlike other proteins it does not coagulate. It is important to cook proteins to the right extent because proteins shrink and becomes harder on overcooking. This also renders them dry and rubbery which is indigestible. Excessive heating of foodstuffs also affects the nutritive value of proteins. Sugars like glucose and lactose form complexes with ammo acids like lysine. These complexes cannot be broken down by the protein digesting enzymes. The result, of course, is that these amino acids are no longer available to the body. Some pulses like soyabean and bengal gram contain certain substances which hinder the digestion of the proteins of these foods by the enzyme trypsin present in our intestines. During cooking these trypsin inhibitors are destroyed. This is why it becomes important not to consume these food raw. In fact, the digestibility of protein in several foods improves as a result of moderate heating in day to day cooking. **1M**

Fats & Oils: Ordinary cooking has no effect on fat, but prolonged heating, as in the case of frying for long periods thickens and darkens the fat. A part of essential fatty acids present in fat are destroyed and toxic polymerized products are formed. These changes are accompanied by changes in flavour also, which may not be acceptable. Fats and oils, become rancid by action of air

(oxidized) water (hydrolysis) and enzymes. These changes must be minimized, so that the food in which fat is used remains acceptable. ½ M

Minerals: There is no loss of minerals in normal cooking procedures. If cooking water is discarded (a small fraction) water soluble minerals may be lost. ½ M

Vitamins: Thiamin and Vitamin C are two vitamins, which are most affected by cooking. The losses may occur due to dissolved nutrients being discarded or destruction due to exposure of heat in cooking. The amount depends on the combination of these factors. Discarding the cooking water accounts for a loss of nearly 20-25 per cent of thiamin depending on the quantity of water used in cooking. If sodium bicarbonate is added to pulses during cooking, most of the thiamine is destroyed. Vitamin C is the most liable vitamin lost during washing vegetables after cutting, exposing cut vegetables to air for long periods before cooking and/or serving and leaching of vitamin C in the cooking water which is later discarded, amounts to a loss of 10% to 60% depending on the vegetables cooked and the method of cooking used. Loss of riboflavin during cooking occur in four ways (i) exposure of the food during cooking to strong light, (ii) loss of riboflavin due to heat (iii) loss of riboflavin due to leaching by discarding excess of cooking water and (iv) loss of riboflavin due to addition of cooking soda during cooking of dal and vegetables. Bottled milk exposed to strong sunlight losses a part of riboflavin present. Loss of other water soluble vitamins are mainly due to heat or loss in water. Vitamin A and Carotene are insoluble in water, so no loss occurs by discarding cooking water. There is slight destruction of vitamin A and carotene during cooking in water due to oxidation by air. Frying, baking, roasting and toasting causes considerable losses of vitamin A and Carotene. 1M

Q.10. Classify the vitamins. Describe sources, functions and deficiency of vitamin C.

Answer: Vitamins are essential nutrients found in foods. They perform specific and vital functions in a variety of body systems, and are crucial for maintaining optimal health. ½ M

The two different types of vitamins are fat-soluble vitamins and water-soluble vitamins.

Fat-soluble vitamins: These dissolve in fat before they are absorbed in the bloodstream to carry out their functions. Eg. vitamins A, D, E and K. ½ M

Water-soluble vitamins: They dissolve in water and are not stored by the body. Since they are eliminated in urine, we require a continuous daily supply in our diet. The water-soluble vitamins include the vitamin B-complex group and vitamin C. ½ M

Sources of Vit C: Citrus fruits and juices are particularly rich sources of vitamin C but other fruits including cantaloupe, honeydew melon, cherries, kiwi fruits, mangoes, papaya, strawberries, tangelo, watermelon, and tomatoes also contain variable amounts of vitamin C. Vegetables such as

cabbage, broccoli, Brussels sprouts, bean sprouts, cauliflower, kale, mustard greens, red and green peppers, peas, tomatoes, and potatoes may be more important sources of vitamin C than fruits 1M

Functions of Vit C: Enhances absorption of iron, reduces iron to more absorbable, ferrous form chelates with ferrous ion to make it more soluble, Antioxidant Activity its reacts and removes active oxygen species, Synthesis of collagen, an important structural component of blood vessels, scar tissues, tendons, ligaments, and bone. Synthesis of the neurotransmitters, norepinephrine critical to brain function and are known to affect mood, Highly effective antioxidant protects proteins, lipids (fats), carbohydrates, and nucleic acid (DNA and RNA) from damage by free radicals, vitamin C is required for the synthesis of carnitine, a small molecule that is essential for the transport of fat to mitochondria, for conversion to energy 1M

Deficiency of Vit C: Scurvy. Cardiovascular Disease, Stroke, Cataracts, Lead toxicity. When vitamin C is deficient, formation of intercellular cement substances in connective tissues, bones, and dentin is defective, resulting in weakened capillaries with subsequent hemorrhage and defects in bone and related structures.

Bone tissue formation becomes impaired, which, in children, causes bone lesions and poor bone growth. Fibrous tissue forms between the diaphysis and the epiphysis, and costochondral junctions enlarge. Densely calcified fragments of cartilage are embedded in the fibrous tissue. Subperiosteal hemorrhages, sometimes due to small fractures, may occur in children or adults. ½ M

Section B

Q.11. Define the following

1. Sol - A sol can be defined as a colloidal dispersion in which a solid is the dispersed phase and liquid is the continuous phase.

2. Co –enzyme- These are non - protein molecules that binds with protein molecule (apoenzyme) to form active enzyme (holoenzyme).

3. Basal Metabolic Rate (BMR) – The amount of energy required to carry on the involuntary work of the body is known as basal metabolic rate.

4. Nutritional Status – It is the physiological state of an individual, which results from the relationship between nutrient intake and requirements and from the body's ability to digest,absorb and use these nutrientsIt includes everything that happens to food from the time it is eaten until, it is used for various functions in the body.

12. State true or false

1. One gram of carbohydrate provides 4 KCal. **Answer: True**
2. Age, sex and physical activity do not affect energy requirement for body. **Answer: False**
3. Fats and oils should be eaten frequently. **Answer: False**
4. Vitamin E is also known as anti-sterility factor **Answer: True**

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I have checked the questions paper as per the given checklist and the question paper is formed.

Signature of the Head of the Department:-

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