 **IQRA NATIONAL UNIVERSITY**

**DEPARTMENT OF ALLIED HEALTH SCIENCES**

**FINAL-TERM EXAMINATIONS**

**SPRING – 2020**

Course title: Macronutrients in Human Nutrition

Course instructor: Prof. Dr. Jehangir Khan Khalil

Department: Human Nutrition and Dietetics, 2nd semester

Time allowed: 6 hrs

Marks: 50 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**NOTE:**

**Attempt all questions.**

**All questions carry equal marks.**

**Questions: 1**

Define the following: (10)

1. Bile acids

**Bile acids:**

. Bile acids are steroid acids found in the bile of mammals and other vertebrae.

. Bile acids are synthesized from cholesterol of liver.

. Bile acids are conjugated with taurine or glycine residues to give anions called bile salt.

. Bile acids are activated by ATP + co-enzyme-A .

. Glycine form as amide linkage with the bile acids and become glycocholic acids

. Taurine also forms an amide linkage with the bile acids and become taurocholic acids .

. **Functions of bile acids:**

**.** Bile contain bile acids, which are critical for digestion and absorption of fats and fat soluble vitamins in the small intestine.

2.Hydrogenation of oil

**Hydrogenation of oils:**

**.** Hydrogenation in the oil and fat industries.

. Hydrogenation is a process that uses hydrogen gas to change a liquids vegetable oil into a hard spread/margarine .

. Hydrogenation reactions are sensitive to a variety of factor that can negatively impact batch time , catalysts life , production rate and selectivity.

. Hydrogenation vegetable oil transfer fat have been shown to harm heart health ., fats can increase a levels of LDL bad cholesterol while decreasing HDL good cholesterol both of which are risk factors for heart disease.

3.iodine number

**Iodine number:**

**.** The iodine value in chemistry is the mass of iodine in grams that is consumed by 100 grams of a chemical substances.

**.** Iodine number are often used to determine the amount of unsaturation in fatty acids.

**.** The unsaturation is in the form of double bonds, which react with iodine compounds.

**.** The number of grams of iodine , which is required to saturated the double bonds present in the 100g of fat.

4.Lecithin

**Lecithin:**

**.** Choline is strongly basic like NaOH .

**.** There are many types of lecithin depending upon the type of fatty acids.

**.** These are most abundant of the phospholipids in serum and bile.

. They are good emulsifying agents for fats.

. They are important constituent of lung surfactant.

5.Triglycerides

**Triglycerides:**

**.** Lipids composed of three fatty acids attached to a glycerol.

**.** Occurs in plants and animals.

**.** 3 fatty acids and 1 glycerol.

. Tri means 3, glyceride means a compound of glycerol.

. Natural fats (it is called natural fat because they are in our body.

. Major class.

**Question: 2**

What are Lipids? What is the difference between fats and waxes? What is the importance of lipids in our body? (10)

**Lipids:**

**Lipids is macronutrients:**

**.** The lipids is the macronutrients (energy).

**Meaning:**

**.** Lipid Greek word is (lipos) which means fats.

**Definition:**

. Lipids are organic compounds made up of fatty acids, alcohol, and many contains other compounds.

**Composition :**

**.**  The lipids is composed of carbon, hydrogen, oxygen, nitrogen, and Phosphorous.

. They are not soluble in polar solvent(water)but soluble in non polar solvent (fat solvent) like benzene , acetone etc.

. Lipids is made up of fats and oils.

. The fats and oils are the tri esters of glycerol with the long chain carboxylic acids.

. They are lighter than water, i-e they have lower density than water.

. They leave greasy mark on paper.

. They includes triglycerides, cholesterol, bile, salt, steroid hormones, fat-soluble vitamins and prostaglandins.

**Difference between fats and waxes:**

**Fats :**

**.** Fats are on of the main macronutrients.

**.** Fats molecules consists of primarily carbons and hydrogen atoms and are therefore hydrophobic.

**.** Fats are soluble in organic solvents.

**.** Fats are insoluble in water.

**.** We need some fats in our diet for energy.

**.** Some fats are not good for health, like fried foods.

**. Examples:**

. Include cholesterol, phospholipids and triglycerides.

**Functions of fats:**

**.** They are high energy foods , providing as much as 9 kcal for every grams.

. Fats serve as vehicles for fats soluble vitamins.

. Fats in the body support such as heart, kidney and intestine.

**Waxes:**

**.** Waxes are the ester of fatty acids which alcohol, other than glycerol ,usually monohydroxy alcohol .

**.** Waxes are distributed widely in plants and animals.

**.** Waxes are not easily hydrolyzed and therefore they are no nutritional value.

**.** Waxes are beeswax, lanolin and spermacen.

**Functions of waxes:**

**.** The wax on the surface of skin and hairs keep the surface of pliable and water repellents.

**.** Earwax protect the delicate lining of tympanic membrane from foreign bodies .

**.**  Beeswax occurs in structural part of honeycomb.

**.** Spermaceti is used by pharmaceuticals , used in cosmetic and in the manufacturing of candles.

**.** Lanolin derived from wool is widely used as a base for many ointments cream.

**Importance of lipids in our body:** The importance of lipids in our body are;

**.** The lipids is providing energy.

**.** The lipids is insulating against temperature externs.

**.** The lipids is protecting against shocks, and building cell structure.

. They ate components of cells and cells organelle.

. They are the major storage forms of energy.

. They are good emulsifying agents.

. They have a high satiety valve.

. In the body 1 gram of fat produces about 9.1 kilocalories.

. Cholesterol is the precursor of bile acids and steroids hormones

. Lipids are the precursor of other important compound , e-g cholesterol, prostaglandins and ketones body.

. 7- dehydrocholestrol is the precursor of vitamin D.

. Prostaglandin have hormone like actions in the body .

. Lipids provide insulation to the nervous system .

. Lipids provides anatomical stability to internal organs and protects against physical stock.

. Lipids under the skin prevents excessive loss of water and electrolytes.

**Question: 3**

What are prostaglandins (PGs)? And what are their functions?

**Prostaglandins :**

**Definition:**

**.** The prostaglandins is the group of compound with varying hormones like effects , notably the promotion of uterine contractions.

**.** They are cyclic fatty acids.

**.** Any of the group of potent hormones like substances that are produced in various mammalian tissues, are derived from arachidonic acids and mediate a wide range of physiological functions, such as control of blood pressure, contraction of uterine, smooth muscles and modulations of inflammation.

**.** Prostaglandin and their related compounds prostacylins , thromboxanes, leukotrienes and lipocins are collectively known as eicosanoid

. They are formed of 20 carbons, knowns as prostanoic acid, which is derived of arachidonic acids.

. Prostaglandin have been detected in almost every mammalian tissues and body fluids.

. Prostaglandin is differ from the hormones formed in almost all tissues in specialized glands and they generally transport in the blood to distance sides of actions.

. Prostaglandin are converted to inactive form of their productions.

. They are not stored in the appreciable amount.

**Functions of prostaglandins:**

. Cause smooth muscles contractions.

. Relive asthma

. Relive nasal congestion.

. Regulate menstruation and fertility.

. Control inflammation.

. Induce blood clotting.

. Vasodilation

. Lower blood pressure

. Platelets aggregations.

. Bronchodilations.

. Inhibits the release of fatty acid frim fats.

**Question: 4**

What are fatty acids? How fatty acids are classified?

**Fatty acids:**

**Definition:**

. The fatty acids is the chains of carbons atoms with hydrogen at tached that has acid group (COOH) at one end and a methyl group (CH3) at the other end.

. The organic acids is acetic acids , that give as vinegar taste its sour taste.

. It is a chain of hydrocarbon.

. Fatty acids are organic acids that occur in nature .

. Complex fatty acids have 98 carbons.

. They are major components of lipids.

. They are made up of 2 carbons atoms.

. Fatty acids, which occurs in neutral fats.

. Fatty acids are non polar.

**Composition :**

The fatty acids is composed of carbon hydrogen and oxygen

**Classes of fatty acids:** The classes of fatty acids are;

1. Saturated fatty acids
2. Unsaturated fatty acids

**1 . Saturated fatty acids:**

**.** The saturated fatty acids having less than 8 carbons atoms are liquids at room temperature and are volatile.

**.** These fatty acids do not contain double bond.

. Single bond is called saturated fatty acids

**Example:**

**.** Acetic acids

**.** Butyric Acids

**2.Unsaturated fatty acids:**

. The unsaturated fatty acids contains double bonds.

. Fatty acids with double bonds.

. Unsaturated fatty acids are further classified according to the degree of their unsaturated i-e monounsaturated and polyunsaturated fatty acids.

**Example:**

. Oleic acids

. Linoleic acids

**Further categories of unsaturated fatty acids:**

**.** Monounsaturated fatty acids

. Polyunsaturated fatty acids

**Monounsaturated fatty acids:**

**.** Mono means one .

. A monounsaturated fatty acids that lacks 2 hydrogen atoms and has one double bond between carbons.

**For Example:** oleic acids..

**Polyunsaturated fatty acids:**

**.** Poly means many.

**.** A polyunsaturated fatty acids that lacks of four and more hydrogen atoms and has two or more double bonds between carbons.

**For Example:** Linoleic acids.

**Question: 5 (10)**

Write short notes on the following:

1. Lipoproteins

**Lipoprotein:**

**.** Lipoproteins are protein-lipid complexes.

**.** Lipoproteins are spherical.

**.** Lipoproteins refer to complex of cholesterol, (triglycerides) and proteins that transport lipids in the environment of blood stream.

**.** These compound lipids; lipoprotein are made up of neutral come (containing TAG or cholesteryl ester or bonds ) surrounded by a shell of Apo lipoproteins , phospholipids and cholesterol.

**.** It is the polar proteins .

**.** Lipoproteins transport lipid in blood.

. Composition of lipoprotein in TAG , cholesterol, phospholipids and purified proteins

**. Types of lipoprotein**: there are 5 types of lipoprotein are ;

1.CM(chylomicron)

2.VLDL(very low density lipoprotein )

3.LDL(Low density lipoprotein)

4 HDL(High density lipoprotein)

5. Intermediate lipoprotein.

1. Cholesterol

**Cholesterol:**

. Cholesterol is a waxy , fat like substances that found in all the cells in the our body.

. Our body needs some cholesterol to make hormones, vitamin D and that helps in digest food..

**.** It is the most abundant animals sterol.

**.** The human body can synthesize about 3gm of cholesterol/day.

**.** Rich sources are adrenal cortex, brain, nerve tissues and egg yolk.

**.** Liver plays a central role in the regulations of body cholesterol balance.

**.** Normal blood cholesterol levels is 200mg/dL.

**.** Variations of cholesterol levels is a very good indicator of cardiac and vascular diseases.

**Functions of cholesterol:**

**.** It is non flexible hence contributes to the rigidity of cell membranes.

**.** It is an important structural component of cell membranes.

**.** It is the precursor of bile acids, steroids hormones and vitamin D3.

**.** 7-dehydrocholestrol, which is present under the skin is converted to vitamin D, when the skin is exposed to sunlight.

**THE END**