Course Title: Biochemistry I
Summer Semester : Final Term
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Max Marks: 50

Note: There are FIVE questions, each carry 10 marks with grand total of 50 marks.
ATTEMPT all questions.
Avoid copy paste material from any source, as it may deduct your marks.

Q1: How Fat soluble vitamins are absorbed by the body.

Q2: Classify the BLOOR classification of lipids, discuss fatty acid and its types.

Q3: Write down the biological significance of any 5 essential minerals.

Q4: Discuss digestion and absorption of lipids.

Q5: Briefly explain function, sources and deficiency symptoms of following vitamins:

I. Retinol

II. Thiamin

III. Pyridoxine

Q No.1

Ans: **Absorption of Fat-soluble Vitamins**

The fat soluble vitamins A, D, E and K are absorbed from the intestinal lumen using the same mechanisms used for absorption of other lipids. In short, they are incorporated into mixed micelles with other lipids and bile acids in the lumen of the small intestine and enter the enterocyte largely by diffusion.

Absorption of Vitamins

Vitamins are organic molecules necessary for normal metabolism in animals, but either are not synthesized in the body or are synthesized in inadequate quantities and must be obtained from the diet. Essentially all vitamin absorption occurs in the small intestine.

FAT-SOLUBLE VITAMINS ABSORBED BY THE BODY:

Rather than slipping easily into the bloodstream like most water-soluble vitamins, fat-soluble vitamins gain entry to the blood via lymph channels in the intestinal wall. Many fat-soluble vitamins travel through the body only under escort by proteins that act as carriers.

The following describes how fat-soluble vitamins are absorbed by the body:

1. **Food containing fat-soluble vitamins is ingested.**

2. **The food is digested by stomach acid and then travels to the small intestine, where it is digested further. Bile is needed for the absorption of fat-soluble vitamins. This substance, which is produced in the liver, flows into the small intestine, where it breaks down fats. Nutrients are then absorbed through the wall of the small intestine.**
3. **Upon absorption, the fat-soluble vitamins enter the lymph vessels before making their way into the bloodstream. In most cases, fat-soluble vitamins must be coupled with a protein in order to travel through the body.**
4. **These vitamins are used throughout the body, but excesses are stored in the liver and fat tissues.**
5. **As additional amounts of these vitamins are needed, your body taps into the reserves, releasing them into the bloodstream from the liver.**

Q No.2

ANS: Thus, Bloor [2] in 1920 classified lipoids into three groups, simple lipoids (fats and waxes), compound lipoids (phospholipoids and glycolipoids) and derived lipoids (fatty acids, alcohols and

sterols). This classification appeals to me and appears to have been accepted until the 1950s.

THERE ARE 3 CLASSIFICATIONS OF LIPIDS

Lipids perform three primary biological functions within the body: they serve as structural components of cell membranes, function as energy storehouses, and function as important signaling molecules. The three main types of lipids are triacylglycerols (also called triglycerides), phospholipids, and sterols.

Discuss fatty acid and its types.

Fatty acid, important component of lipids (fat-soluble components of living cells) in plants, animals, and microorganisms. Generally, a fatty acid consists of a straight chain of an even number of carbon atoms, with hydrogen atoms along the length of the chain and at one end of the chain and a carboxyl group (—COOH) at the other end. It is that carboxyl group that makes it an acid (carboxylic acid). If the carbon-to-carbon bonds are all single, the acid is saturated; if any of the bonds is double or triple, the acid is unsaturated and is more reactive. A few fatty acids have branched

chains; others contain ring structures (e.g., prostaglandins). Fatty acids are not found in a free state in nature; commonly they exist in combination with glycerol (an alcohol) in the form of triglyceride.

Q No.3

ANS:

Mineral	Function	Sources
Sodium	Needed for proper fluid balance, nerve transmission, and muscle contraction	Table salt, soy sauce; large amounts in processed foods; small amounts in milk, breads, vegetables, and unprocessed meats
Chloride	Needed for proper fluid balance, stomach acid	Table salt, soy sauce; large amounts in processed foods; small amounts in milk, meats, breads, and vegetables

Potassium	Needed for proper fluid balance, nerve transmission, and muscle contraction	Meats, milk, fresh fruits and vegetables, whole grains, legumes
Calcium	Important for healthy bones and teeth; helps muscles relax and contract; important in nerve functioning, blood clotting, blood pressure regulation, immune system health	Milk and milk products; canned fish with bones (salmon, sardines); fortified tofu and fortified soy milk; greens (broccoli, mustard greens); legumes
Phosphorus	Important for healthy bones and teeth; found in every cell; part of the system that maintains acid-base balance	Meat, fish, poultry, eggs, milk, processed foods (including soda pop)
Magnesium	Found in bones; needed for making protein, muscle contraction, nerve transmission, immune system health	Nuts and seeds; legumes; leafy, green vegetables; seafood; chocolate; artichokes; "hard" drinking water

Q No. 4

ANS: DIGESTION AND ABSORPTION OF LIPIDS:

Chylomicrons are formed in the intestinal cells and carry lipids from the digestive tract into circulation. Short- and medium-fatty chains can be absorbed directly into the bloodstream from the intestinal microvillus because they are water-soluble. Cholesterol absorption is hindered by foods high in fiber.

Lipid metabolism disorders, such as Gaucher disease and Tay-Sachs disease, involve lipids. Lipids are fats or fat-like substances. They include oils, fatty acids, waxes, and cholesterol. If you have one of these disorders, you may not have enough enzymes to break down lipids

Q No. 5

ANS: 1 Retinal: Within cells, **vitamin A** (retinol, retinal, retinoic acid) functions mainly in vision, cellular differentiation, and embryogenesis. The adverse effects of **vitamin A** deficiency on complex physiological processes such as **reproduction** and the immune response result primarily from defective cellular differentiation.

Retinal sources:

Vitamin A1, also known as retinol, is only found in animal-sourced foods, such as oily fish, liver, cheese and butter.

Beef Liver — 713% DV per serving.

Lamb Liver — 236% DV per serving. .

Liver Sausage — 166% DV per serving.

Cod Liver Oil — 150% DV per serving. ..

King Mackerel — 43% DV per serving. ..

Salmon — 25% DV per serving

2 Thaiman: Thaiman (vitamin B1) helps the body's cells change **carbohydrates** into **energy**. The main role of **carbohydrates** is to provide **energy** for the **body**, especially the brain and **nervous system**. Thiamin also plays a role in muscle contraction and conduction of nerve signals. Thiamin is essential for the **metabolism** of pyruvate

Thaimin Sources: Food **sources** of thiamin include whole grains, meat, and fish [2]. Breads, cereals, and infant formulas in the United States and many other countries are fortified with thiamin [2]. The most common **sources** of thiamin in the U.S. diet are cereals and bread [8]. Pork is another major **source** of the vitamin.

3 Pyridoxine Functions

Vitamin B6 plays an important role in the body. It is needed to maintain the health of nerves, skin, and red blood cells. Pyridoxine has been used to prevent or treat a certain nerve disorder (peripheral neuropathy) caused by certain medications (such as isoniazid).

Vitamin B6, also known as pyridoxine, helps: the body to use and store energy from protein and carbohydrates in food.

Pyridoxine Sources

Vitamin B6 is found in a wide variety of foods, including:

Pork.

Poultry, such as chicken or turkey.

Some fish.

Peanuts.

Soya beans.

Wheatgerm.

Oats.

Bananas.

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