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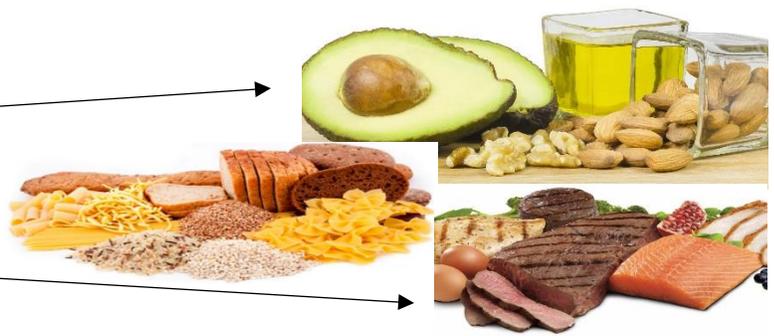
Topic 3.1 – Nutrients

IB SEHS

3.1.1. List the macronutrients and micronutrients

Macronutrients:

- lipid (fat)
- carbohydrate
- protein
- water (says the book)



Micronutrients:

- vitamins
- minerals
- fiber (kind of)

3.1.2 Outline the roles of macronutrients and micronutrients

▪ Lipids

- Lipids are an essential part of the _____ and are a part of _____ cell in the body.
- They provide a _____ source of energy for the body and assist in the transport of the fat-soluble vitamins (A, D, E & K) to the small intestine for digestion.
- _____ (a type of lipid) is an essential ingredient for both male and female and female hormones and also has an important function in healing processes and cell building.
- Other fats such as essential _____ acids are fundamental to brain and nerve function.
- **Most people think of this class of macromolecule as ‘fats’, but these are just one _____ of lipid of great importance to us, along with oils, phospholipids and _____.**
- They are a diverse group of _____. Fats and oils differ with respect to whether they are solid or liquid at normal temperatures.

▪ Carbohydrate

- In general carbohydrates should form the _____ of every meal and snack – because _____ (how we store carbs) stores in the muscles provide the energy for performance.
- Muscle glycogen and blood glucose are the _____ used for energy for short-duration, _____, **anaerobic activities. (fats can't be broken down and used during high intensity exercise)**
- After all of the stored glycogen and _____ glucose have been burnt as fuel during activity, fats become a _____ fuel source (during certain intensities of exercise).

▪ Protein

- Proteins are made of various _____ of the _____ amino acids.
- Nine of these amino acids are called “_____” amino acids – **because they can't be _____ by the body, and must be supplied by the diet.**

-The major function of amino acids is to _____ and _____ cells of the body. The body breaks down food into amino acids and then makes its own protein.

- Another function of protein is to provide energy in _____ conditions – such as starvation.

▪ **Water**

- Water is the main _____ of cells, urine, sweat, and blood, and makes up about two-thirds of total body weight. Water is used for transport and for cooling.

- When fluid is lost, cells become _____ and their and their functions are impaired. Cells can't build tissue or utilize _____ efficiently. _____ is not produced and toxins accumulate in the blood. Sweating does not occur and body temperature _____. Blood volume decreases and their less blood to transport oxygen and nutrients.

▪ **Vitamins**

- Required for health, and for _____ performance at competitions and training.

- Deficiencies can lead to early _____, infections, illness and slower recovery time from injury.

- Vitamins are _____ compounds that are required in small quantities for normal growth, development, and metabolism.

- **They act as co-enzymes to _____ the enzymes that catalyze the breakdown of carbohydrates, proteins, fats and minerals.**

- They are divided into two distinct groups – _____ soluble and _____ soluble vitamins.

- Fat soluble are A, D, E and K. They are usually stored in the body, and high levels of these can be _____.

- Water soluble are the B group and Vitamin C. These _____ be supplied regularly and frequently to the body through diet or supplementation. **Because they _____ in water they are easily expelled from the body.**

- The main vitamins needed for _____ are Vitamin C and the B-complex (different B vitamins).

- Vitamin C is needed for _____ to infection, and for stress management.

- B-complex are required for energy _____ and release.

▪ **Minerals**

- Include _____, potassium, iron, sodium, phosphorus, and _____.

- All of these are important in cellular functions such as muscle _____, fluid balance and energy systems.

- _____ in certain minerals can sometimes impede athletic performance. For example, female _____ might find it necessary to take iron supplements during heavy training (lower hemoglobin / blood volume / etc).

▪ **Fiber**

- Fiber is the part of the plant that can't be _____ by the body.

- Moderate amounts of fiber promote:

▪ a _____ rise in glucose level.

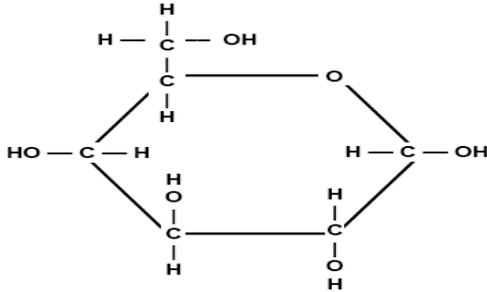
▪ a lower _____ requirement & lower cholesterol levels. (we will discuss insulin later)

▪ normal _____ function and reduced chance of _____

3.1.3 State the chemical composition of a glucose molecule

- Glucose is an example of a _____ which is commonly encountered. It is also known as blood sugar, and dextrose.
- Its chemical formula is C₆ H₁₂ O₆, and this _____ formula is shared by other sugars - called hexoses - 6 carbon sugars. This chemical composition is a 1:2:1 ratio.

3.1.4 Draw a diagram representing the basic structure of a glucose molecule



3.1.5 Explain how glucose molecules can combine to form disaccharides and polysaccharides

- Many of the most important carbohydrates are the more _____ disaccharide and polysaccharides rather than the simpler monosaccharides.
 - **Disaccharides**
 - When _____ monosaccharide molecules react or condense (go through dehydration synthesis) with each other, losing a _____ molecule in the process, the product is a disaccharide. Several disaccharides are common in nature, the most well-known being sucrose. _____ is also called cane sugar, beet sugar, table sugar, and dextrose. Sucrose is a disaccharide of glucose and fructose.
 - Disaccharides will react with water, especially in the presence of enzymes such as those supplied by _____, to form **invert sugar**. Invert sugar is a mixture of the two monosaccharides and is responsible for the sweet taste of honey.
 - **Polysaccharides**
 - A polysaccharide is a _____ of one of the monosaccharides. All of the well-known polysaccharides found in nature are polymers of glucose.
 - Several familiar materials are polymers of glucose: _____, which is poly-alpha-glucose; _____, which is poly-beta-glucose; and _____, which is a differently branched form of poly-alpha-glucose.
 - Monosaccharides can undergo a series of _____ reactions (loses a water molecule), adding one unit after another to the chain until very large molecules (polysaccharides) are formed. This is called **condensation polymerization**, and the building blocks are called _____
 - Cellulose is used to form plant _____ since it is not _____ in water, while plants use starch for energy storage.
 - Animals store energy as _____ or, for longer-term storage, convert glycogen and other carbohydrates to lipids.

3.1.6 State the composition of a molecule of triacylglycerol (TAG)

- Triacylglycerols (pretty much just a triglyceride) are _____ lipids stored mostly in adipose (fat) cells and tissues, which are highly _____ stores of metabolic energy.

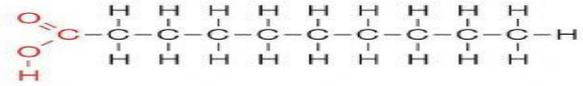
As the name triacylglycerols implies the molecules are composed of three Fatty Acids attached to a glycerol skeleton. (Glycerol is a central component of lipids)

- TAG is the preferred form for _____ storage because Fatty Acids have greater potential chemical energy due to having more CH groups than does glucose, which is already partly oxidized (more oxygen molecules) with plenty of OH groups.

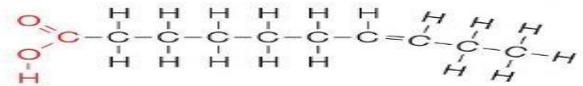
3.1.7 Distinguish between saturated and unsaturated fatty acids

- A fatty acid is a _____ acid (an organic compound that contains a carboxyl group - COOH), which is either saturated or unsaturated.
 - Most of the natural fatty acids have an even number of carbon atoms, because their biosynthesis involves acetyl-CoA, an enzyme that has two carbon atoms that helps break down fatty acids.
- **Saturated fats have no _____ bonds** between their carbon atoms and tend to be solid at room temperature.
- Whereas **unsaturated fats (one or _____ double bonds)** are liquid at room temperature and therefore considered oils.

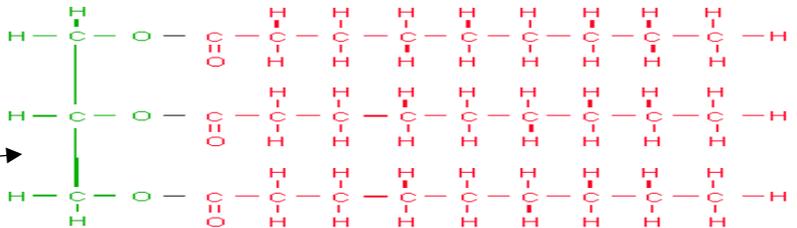
Saturated



Unsaturated



- **Saturated Fatty Acids**
 - The term “saturated” refers to the _____, in that all carbons contain as many hydrogens as possible.
 - Saturated fatty acids form _____ chains and, as a result, can be packed together very tightly, allowing living organisms to store energy very densely.
 - Foods that contain a high proportion of saturated fat include butter, coconut oil and dairy products. Diets high in saturated fats are _____ with an increased incidence of atherosclerosis and coronary heart disease.
- **Unsaturated Fatty Acids**
 - In cellular _____ hydrogen-carbon bonds are broken down (or oxidized) to produce energy, thus an unsaturated fat molecule contains somewhat less energy (less kilojoules) than a comparable sized saturated fat.
 - Foods containing _____ fats include avocado, nuts and vegetable oils, such as soy bean canola and olive oils.
 - Although, unsaturated fats are healthier than saturated fats their _____ should still be limited.



3.1.8 Draw a diagram representing the basic structure of a lipid molecule



