# Complex can only be seen on its own

Science, Biology

Complex carbohydrates can only be found as polysaccharideswhich means they have lots of sugar units.

Glycogen, cellulose and starch all contain lots of sugar units so theyare classed as polysaccharides, but starch is the only one that can be brokendown further in to amylose and amylopectin. Complex carbohydrates can be found in foods like beans and whole grainsand also contain a high amount of minerals and vitamins. Complex sugarsA compound sugar is formed when monosaccharidescome together and join.

Each time a bondis made, a molecule of water is lost which is known as a condensationreaction. Although molecules are lostwhen they bond, they can still be reverted back to their original structure bya process called hydrolysis. Simple sugars can be broken down into twogroups. Monosaccharides which consistsof one sugar unit, and disaccharides which have two sugar units. Galactose, fructose and glucose all containone sugar unit which makes them monosaccharides, but sucrose, lactose andmaltose all poses two sugar units which makes them disaccharides. Simple sugars Glucose is controlled by insulin which is a hormonethat is responsible for informing cells when they need to take in glucose.

When your cells stat taking the glucose, thepancreas has to start making glucagon, which then informs your liver to sharesome of the stored glucose to give the body more energy. Carbohydrates are turned into glucose by yourdigestive system which is used for energy, but some gets stored away in yourmuscles and liver to get used later. Carbohydrates are the main source of fuel for thebody, which provides us with energy to help generate brain

function and assistsus with physical activities as well as helping our organs to function.

Carbohydrates are needed by all the tissuesand cells in your body to help them work efficiently along with waste eliminationand intestinal health. Carbohydrates areneeded the most by the body as they are one of the main sources ofnutrients.  The purpose of carbohydratesDID YOU KNOW…There are 4 calories per gram! Hydrogen, carbon and oxygen are all responsible forthe formation of simple, soluble and complex carbohydrates. Main types of carbsWhen a group of monosaccharides come together andbond, they create a polysaccharide, which can be found in long chains.  Starch and glycogen are both made with a polysaccharidestructure. PolysaccharideA monosaccharide can only be seen on its own ineither a ring like shape, or a long straight chain.  If a covalent bond connects twomonosaccharides together, it then becomes a disaccharide, and both structuresare water soluble.

MonosaccharidesSimilar to glucose, the carbons bond together atthe first and fourth carbons, but also poses a covalent bond which allows themolecules to be re-shaped by bonding at the first and sixth points. Glycogen structureThe molecules of a glucose structure bondtogether at the same points through the structure.  One molecule joins their first carbon to thefourth of another, and because of this, they can only be seen in straightlines.

Glucose structure Carbohydrates  Consists of 4 protein molecules which are two?-helices and two ?- helices.  It can befound in red blood cells and assists

with transporting oxygen and carbon dioxidearound the body. (Davis. C 2017)Haemoglobin Chemical reactions that happen in cells can have anincreased rate of speed by biological molecules called enzymes. In the body, processes like digestion andmetabolism are aided by enzymes. Theyalso bind molecules together and make some smaller so they all become easier tomanage and transport. (Castro.

A 2014)EnzymesNeeded by the immune system to help protect thebody, bacteria and viruses are picked up by the antibodies, which are proteinsin a large Y shaped structure. AntibodyBiological processes that need to happen betweenvarious cells are signaled by proteins and some hormones. MessengerSmall molecules and atoms from cells can be carriedaround the body using proteins. Transport/storageIn cells, proteins offer the support and structurethat they require. Structural componentThe way multiple polypeptide chains are arranged ina protein is called a quaternary structure, but each protein still has aspecific sequence. It normally consistsof 2 lighter, and 2 heavier chains that are stabilized with multiple hydrogenbonds. Quaternary structureThe 3-D structure of a protein overall that is heldtogether by hydrogen bonds between the two chains that are positively andnegatively charged. Disulphide bridgesform between two amino acids to help reinforce the structure.

Unlike the secondary structure, the R groupsof amino acids move towards the center of the structure to avoid any water thatmay be present within the structure. (Khan academy 2017)Tertiary structureTwo 3-D helices that pull together form thesecondary structure. If the chain has aspiral like shape, it

is called an ?- helix, which occurs when the polypeptidehas a repeated pattern, but if it has a folded or pleated shape, it is known asa ?-helix. This happens because of thehydrogen bonds, which provides stability to the structure as there are somany. In an ?-helix, the R groups ofamino acids all point towards the outside of the helix. Secondary structure The sequence of amino acids are different betweeneach protein depending on their purpose and size. A dipeptide bond occurs when two amino acidsbond together, but more than two then become polymerization, and a polypeptideis created when hundreds of amino acids bond, and the DNA decides the order ofthe amino acids which provides us with the primary structure.

Primary structure With twenty types of amino acids, they can becombined in varied sequences to produce proteins which depends on the 3-Dstructure and the purpose of the protein. The foods we eat can provide us with 9 of the amino acids our bodyrequires, and the remaining 11 can be produced by our body's. Intro Proteins (The Columbia encyclopedia 2017)Pyrimidines are a heterocyclicorganic compound containing 2 nitrogen atoms at 1 & 3. Purines are a heterocyclic organic compound consistingof a pyrimidine ring & imidazole ring. Each cell in the body contains around 2M of DNA. If all the DNA in thebody was stretched out, it would reach to the moon and back 8000 times. (Helmenstine.

A, 2017)Did you know… After transcription, mRNA takes the copied geneticcodes, (RNA) and decodes it in to the desired sequence which forms apolypeptide chain of amino acids which happens in the cytoplasm. Translation also ends at the terminationstage where it will receive a signal

for it to end it cycle. (Biology-online dictionary, 2017) Translation This is when DNA is copied and a strand of RNA isformed.

This is completed by polymeraseswhich are also known as enzymes, and occurs for each gene separately. This process ends at the termination stagewhich produces a signal that tells the transcript that is job is done, but thisvaries depending on the sequences it is signaling. (Khan academy 2017)TranscriptionDNA is responsible for genetic characteristics andis the main component of chromosomes. Two nucleotides twisted around each other, similar to a ladder, consisting of deoxyribose and phosphate and bases A, G, C, and T, togethercreate DNA. The sequence that containsthe encoded genetic information is transcribed as the strands of DNA unwind andare replicated.

DNA An organic base consisting of adenine, guanine, cytosine, uracil, and pentose sugar (Ribose) nucleotides together form a singlestrand polymer which presents itself as RNA. It is used in the body for processes like coding and regulation. mRNA (Messenger) is responsible for carryingcodes from the nucleus to the cytoplasm. (Britannica 2017) rRNA is acomplex molecule created with double and single helices and is required forprotein synthesis.

tRNA- There are 20varieties of tRNA, and each one carries a different amino acid can be found inthe shape of a clover leaf with the end of one chain ending in C, C, A, whichis known as the anticodon, which connects with mRNA during synthesis. (Toole & Toole 1999)RNA The structure of a single nucleotide consists ofthree properties. Phosphoric acid, pentose sugar, and an organic base. Condensation reactions allow these three elements to

combine and becomea nucleotide. When two nucleotides bondtogether, a dinucleotide is formed, and re-occurring condensation reactionscreate a polynucleotide which is a long chain of nucleotides that have hydrogenbonds between carbons 1 and 5, and when sugar and phosphate join, it is thenknown as a phosphodiester bond. (Toole& Toole 1999) Nucleic acids In the body, some of the important molecules usecholesterol as a building block so start from like bile acids and steroidhormones which includes sex hormones. Itis vital for the synthesis of vitamin D, which happens in the liver and cells, and is obtained from your diet, and transported around your body by the bloodstream, and is also hydrophobic so it is insoluble.

CholesterolWax is highly insoluble, and at room temperature, is more solid than oils. It alsoprovides a waterproof layer that prevents water loss, and because it hashydrophobic properties, it stops water from being absorbed. Wax Lipids provide thebody with nine calories per gram, making them the most energy rich component offood.

Did you know… One fatty acid chain is replaced by a phosphatebase group which makes the head of the molecule soluble in water (Hydrophilic), but the tails of the molecule are still insoluble in water (Hydrophobic), thisis known as an amphipathic molecule. Aphospholipid is the main part of the cell membrane. It is made up of a glycerol molecule and a phosphategroup, and form a double layer when many of them join up. (Biology Dictionary (2017) PhospholipidsA glycerol molecule with three fatty chainsconnected by covalent bonds, and are known as an ester bond which are formedwhen a condensation reaction occurs. Each triglyceride contains a carboxylic acid

group which can be found atthe terminal carbon atom and are normally made of around 14-22 carbons long. They are hydrophobic which means they areinsoluble in water.

To prevent thehydrogen bonds forming with the water molecules, the charges are distributedevenly around the molecule. (A-Levelnotes 2016)TriglyceridesAs opposed to saturated fatty acids, unsaturatedfatty acids contain some double bonds. If only one double bond is present, it is known as monounsaturated, butif more than one double bond can be found, then it is known aspolyunsaturated. At room temperature, fats with unsaturated tails are normally found as liquids which makes itdifficult for them to pack together tightly.

Unsaturated fatty acidsA saturated fatty acid is composed of a chainconsisting of hydrogens and carbons connected by single bonds, and can be mostcommonly found in the length of 18 bonds that can mainly be found in foods, andat room temperature, is usually solid. (Mclaughin, 2017)Saturated fatty acidsLipids are a high energy source that are required for theabsorption of fat soluble vitamins. There are two main types of lipids; simple lipids and complexlipids. They are not soluble in water soare known as hydrophobic, but are soluble in organic solvents like alcohol andacetone.

Lipids also act as aninsulating layer under the skin to help keep the body warm. Lipids are made from hydrogen and carbonwhich gives them the name hydrocarbons. “ When metabolized, lipids are oxidized to release large amounts ofenergy and thus are useful to living organisms Lipids are

molecules that can beextracted from plants and animals using nonpolar solvents such as ether, chloroform and acetone” (Mandal, 2012)