BIO Notes On Organic Chemistry Essay, Research Paper

The chemistry of life

(Living things made mostly of carbohydrates, fat and protein)

CARBOHYDRATES energy producer

• Contain carbon, hydrogen and oxygen

• Glucose is the simplest (dissolves easily in water) monosaccharide

• Starch is also common (solid, lots of glucose molecules in a chain (condensation)) disaccharide

• Starch is broken down into glucose as well (add water◊hydrolysis)

FAT energy producer insulation and energy store

• Contain carbon, hydrogen and oxygen

• Contains more carbon + hydrogen

• Fat molecule is made up of glycerol and fatty acids.

• Condensation and hydrolysis play parts here?

PROTEIN

• Contain carbon, hydrogen, oxygen, nitrogen (and sulphur)

• Made of blocks (amino acids) and links (peptide links)

• 22 amino acids in nature

• Hydrolysis ◊ chain of proteins split (polypeptides) then broken to small amino acids

• Reverse in condensation

• Soluble proteins make up enzymes.

• Denaturalisation occurs when molecule shape changes when heated.

CHEMICAL REACTIONS

• Occur mainly in gut and cells

• Reactions in cells is metabolism

• Breaking down or joining options

• All reactions are catalysed by enzymes.

Enzymes

IMPORTANCE

• To speed up reactions

• They are biological catalysts

• TYPES

Extracellular enzymes are produced and leave cell to work outside

• Intracellular enzymes work inside cell

ENZYME CONTROLLED REACTION

• Maltose (substrate) ◊maltase (enzyme) ◊ glucose (product)

PROPERTIES

• Always proteins

• Specific

• Reusable

• Destroyed by heat over 45 Celsius

• Sensitive to pH

HOW DO THEY WORK?

• Enzyme molecule has active site

• Substrate fits into active site

• Reaction takes place

• Products leave site.

HELPING HINDERING

• Anything which helps substrate reach enzyme speeds up reaction

• Poisons stop temporarily/ permanently the active site

ENZYME USE

• Biological washing powders

• Tenderising meats, skinning fish, removing hairs

• Softening vegetables, removing seed coats

• Syrups, fruit-juices, chocolates

Food and Diet

OUR DIET

• Carbohydrates

• Fats

• Proteins

• Water

• Minerals

• Vitamins

CARBOHYDRATES

• Sugar gives energy

• Starch are normally found in small grains called starch granules they also give us energy

• Cellulose for plants make a cell wall for humans it makes a dietary fibre keeping the food moving along the gut

FATS

• Mainly give us energy

• Saturated means that there is no more room for atoms to add on to the existing molecule.

• Unsaturated is the opposite.

PROTEINS

• Needed for growth repair and slight amounts of energy

• Kwashiorkor ◊ disease with the lack of protein

• Proteins are made of amino acids

• Essential amino acids are ones we cannot make but instead take in digestively

WATER

• Absolutely essential

• Needed in all life forms and contained in mostly all substances

MINERALS

• Sodium. Is a salt. It helps messages to be sent and muscle contraction. Lack of causes cramps in muscles

• Calcium used for hardening our bones and teeth. Hardening can only take place when they take up calcium phosphate and carbonate (calcification). Lack of causes rickets (soft, weak, deformed bones).

• Phosphorus. We need it to be absorbed into the calcium. It occurs in membranes.

• Iron. Present in haemoglobin (transports O2). Lack of cause anaemia: less O2 transported, less energy.

• Iodine. Trace element: needed in tiniest quantities. We get from sea food and drinking water. Needed to make thyroxine. Lack of causes goitre or ?Derbyshire neck?: swelling of thyroid gland next to Adam?s apple.

• Fluorine. Trace element. Prevents tooth decay.

VITAMINS

• Collection of organic substances which control reactions in the body.

• (A). Retinol: important for our eyes. Lack of causes night-blindness or xerophthalmia. Fat soluble

• (B). Niacin (nicotinic acid). Lack of: Pellagra. Thiamine: lack of is Beri-beri. Riboflavin: causes sores in skin around mouth. Water soluble

• (C). Ascorbic acid. Keep epithelia healthy. Lack of cause scurvy: bleeding in various parts of the body. Water soluble

• (D). Calciferol. Helps child?s bones become strong. Lack of cause rickets. Can be obtained from fish liver oil or the body through sunlight. Fat soluble

• (E). Found in milk and egg yolk. Lack of cause sterility. Fat soluble

• (K). Helps blood clot. Lack of causes internal, external bleeding. Fat-soluble.

• Composition of different foods helps us identify useful substances.

• Vegetarian: eats no animal meat but does eat products. Vegans do not eat animal products.

• Food additives: substances that are added to food. Some give change to colour, taste, preservation or consistency.

How substances are stored

WHY DO ORGANISMS STORE SUBSTANCES?

• So that they can survive when food is unavailable or scarce

• Man can survive several weeks

WHERE ARE SUBSTANCES STORED?

• The main storage place is the liver for humans.

• For plants they swell up and make the swelling the storage place. The plant storage organ can survive harsh conditions then a new plant spouts and the food is moved there.

PLANTS STORAGE SYSTEM

• Green plants produce glucose that is either used straight away or turned into starch and converted back to glucose when needed.

• Other substances can be made from glucose in plants (oil, sugar)

REQUIREMENTS FOR TURNING STARCH INTO GLUCOSE

• Enzyme

• Can be tested with starch

HOW STARCH IS TURNED INTO GLUCOSE

• Glucose molecules join together and coil up forming a starch grain (condensation)

• The starch grain can de-coil and split up forming Glucose (hydrolysis)

ANIMALS STORAGE SYSTEM

• Get glucose from food

• They turn glucose into glycogen

• Glycogen is a bondage of glucose molecules linked together

• Stored in the liver

• It is also stored as fat

MOBILISATION

• This is when a solid form of food has to be transported and it is broken down into a solution.

• Starch and glycogen are broken down into glucose.

• Fat is broken down into fatty acids and glycerol

IMPORTANCE OF FOOD STORES

• Storage of food in organisms usually mean they are going to be packed together closely, this means anything like this can be a rich source for humans

Obtaining energy from food

FOOD CONTAINING ENERGY

• We can check this by burning food and estimating the amount of heat given out. (kJ)

• kJ per Gram carbohydrates-17, fat-39, protein-18

ENERGY CONTAINED IN FOOD

• determines how it should be cooked

• Depends on substances inside the food.

ENERGY PER DAY

• Basal metabolic rate: rate at which body processes take place

• Roughly 7000kj per day if lying down doing nothing

• At least 9200 kJ per day for doing nothing but essential tasks

EXCESS EATING

• Most excess not used is turned into fat. Body weight increases

• Obesity is when we take in more energy (through food) than we give out.

• More exercise, consumption of less energy-containing foods stop or decrease obesity

MINIMAL EATING (STARVATION)

• First energy stores from fat will be used up.

• Takes energy from muscles

• Becomes thin and weak

• Anorexia nervosa: psychological loss of appetite

• Marasmus wasting away due to starvation

Energy release-respiration

FOOD BURNING

• Oxygen is needed

• Carbon dioxide, water and heat are produced

ENERGY PRODUCTION IN HUMANS

• C6H12O6 + 6O2◊ 6CO2 + 6H2O + ENERGY

• We can check the relationship between O2+CO2 and breaking down of food by using radioactive tracers and mice.

ENERGY USES

• Animal-movement, messages, transportation, warmth, growth, cell division, osmosis, and life!

• Plants taking up mineral salts, opening/closing stomata, transporting food substances, growth, cell division, osmosis, and life!

CHEMISTRY OF RESPIRATION

• Respirometer measures amount of oxygen taken in

• Energy produced from glucose is linked to adenosine triphosphate (ATP)

• Breakdown of glucose is used to make ATP

• ATP not Glucose gives energy towards muscle contractions