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BIOLOGY

FOUNDATIONS IN BIOLOGY

Level & Board	OCR (A-LEVEL)
TOPIC:	BIOLOGICAL MOLECULES - CARBOHYDRATES
PAPER TYPE:	SOLUTION - 1
TOTAL QUESTIONS	8
TOTAL MARKS	/31

Biological Molecules – Carbohydrates - 1

1.

(a) A

2.

(a) D

3.

(a) B

4.

(a) C

5.

(a) β / beta glucose

(b) Carbohydrates are macromolecules composed of carbon (C), hydrogen (H), and oxygen (O). In general, carbohydrates will have the formula of $C_x(H_2O)_y$. Carbohydrates are classified based on the following chemical characteristics: The number of carbons.

(c) In deoxyribonucleic acids, DNA, the carbohydrate is deoxyribose with cytosine, thymine, adenine and guanine bases.

6.

(a) It contains N / nitrogen or monosaccharide does not contain nitrogen

(b)

beta / β glucose

(c)

Condensation reaction

Releases a water molecule

Similar to cellulose

Alternate monosaccharides upside down

OR

Similar to cellulose

Has a straight chain

Chitin glycosidic bonds -> formed by condensation

A by product of H_2O is formed

Alternative monomer = flipped upside down at 180 degrees

7.

(a) Starch and glycogen

(b) In both plants and animals, carbohydrates are the most efficient source of energy.

They are stored as starch and glycogen form in plants and animals.

The polymeric carbohydrate starch, also known as amylum, is made up of multiple glucose units joined by glycosidic connections.

Most green plants generate this polysaccharide to store energy.

It is a white powder that has no flavor or odor and is insoluble in cold water or alcohol.

The enzyme glucose

phosphate adenylyl transferase is used by plants to convert glucose

phosphate to ADP-glucose.

Glycogen is a multi-branched polymer of glucose that is used to store energy in animals. The polysaccharide structure is the body's primary glucose storage structure.

In both animals and humans, it is predominantly found in muscle and liver cells.

When blood glucose levels are increased, glycogen is made from glucose, and when blood glucose levels fall glycogen serves as a quick source of glucose for tissues throughout the body.

Each molecule is linked to another by a glycosidic bond, which is a link from the first carbon atom of the active glucose residue to the sixth carbon atom of the approaching glucose molecule.

Therefore, starch and glycogen are the storage form of carbohydrates in plants and animals.

Lipids

Lipids, including triglycerides, fat cells, lipoproteins, and cell membranes, are processed in various forms in the body. Any excess energy absorbed is converted into triglycerides, which along with globules make up 90 percent of fat cells. To keep the body going, these fat cells have enough energy storage for 30 days.

While glycogen provides a ready supply of energy, lipids serve primarily as a power reservoir. Glycogen is very dense with a high-water volume, so the body cannot retain too much for long. Alternatively, fats are densely mixed together without water and retain even greater quantities of energy at a smaller volume.

The key difference between lipids and fats is that lipids are a broad group of biomolecules, whereas fats are a form of lipids. Fat is stored inside the adipose tissue and under the skin of animals. Generally, it is found as an energy-storage molecule in the body.

Note: Fats and oils, waxes, enzymes, and phospholipids are among the main groups. Sometimes referred to as triglycerides or triacylglycerols, fats are a concentrated form of nutrition. Cholesterol is a form of blood fat, and blood fats are known as lipids. In the blood, cholesterol and other lipids are transferred, forming tiny balls or 'parcels' attached to proteins such as lipoproteins. So, proteins plus lipids are lipoproteins.

Plant lipids are diverse and essential for cells. They are essential for the integrity of cells and organelles by acting as a hydrophobic barrier for the membrane. In addition, lipids are stored in the form of chemical energy in seeds. Furthermore, they act as a signal molecule to regulate cell metabolism [1,2]. The main form of lipid in plants is the glycolipid in which the carboxyl group of the fatty acid is ester-linked with the hydroxyl group of glycerol. Lipid synthesis involves several organelles in a cell. Fatty acid is synthesized from chloroplasts, and is directly combined with glycerol to

become a galactolipid, a major component of the chloroplast membrane, and fatty acids are transferred to the cytoplasm to bind with glycerol in the endoplasmic reticulum (ER) to become a phospholipid of the cell membrane. Between the ER membranes of the seed cells, triacylglycerol (TAG) is synthesized and stored in the oil body. In addition, in the ER of the epidermal cell, fatty acid is transformed into components of cutin and wax, which are lipids of the cuticle layer that prevent water loss. Fatty acid, glycolipid, and triacylglycerol biosynthesis pathways have been identified through genetic analysis using Arabidopsis mutants. Recently, researchers have been conducting research on the discovery of transcription factors that regulate lipid synthesis, the role of galactolipids in photosynthesis, cuticle lipid synthesis and transport and lipid remodeling during development and stress. To improve the quality and quantitative traits of plant oil in terms of application, studies on the modification of fatty acid composition and the enhancement of oil content are underway

8.

(a)

Both

Contain, C / carbon (atoms) and H / hydrogen atoms

Contain O / oxygen atoms

Have OH / hydroxyl / hydroxide groups

(b) Glucose is soluble in water

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