IMPORTANT QUESTIONS CLASS – 11 BIOLOGY CHAPTER -9 BIOMOLECULES

Question 1.
Enlist the functions of small carbohydrates?

Answer:

1. Monosaccharides are formed during the photosynthetic pathway. They are stored in plants and are utilized by other living organisms depending on them.
2. Glucose is the blood sugar of many animals and on oxidation, it provides energy for all vital activities.
3. Nucleotides and nucleosides contain pentose sugar in the form of ribose and deoxyribose sugars. They form a part of nucleic acids.
4. Lactose of milk is formed from glucose and galactose and mammary glands of mammals.
5. Glucose is used for the synthesis of fats and amino acids.
6. Structural polysaccharides like cellulose and oligosaccharides are derived from monosaccharides.
7. Food storage polysaccharides like starch and glycogen are derived from monosaccharides.

Question 2.
Enumerate the functions of Lipids.

Answer:

1. Lipids are storage products in plants as well as animals.
   (a) In plants, fats are stored in cotyledons or endosperm to provide nourishment to the developing embryo.
   (b) In animals fats are stored in adipocytes to be used whenever required by the body.
2. In animals, subcutaneous fats act as an insulation layer and shock \ absorber.
3. They form structural components of membranes, phospholipids, glycolipids, and sterols.
4. They take part in the synthesis of steroid hormones, vitamin D, and bile salts.
5. Act as a solvent for fat-soluble vitamins i.e., vitamin A, D, E, and K.

6. The neutral fats form a concentrated fuel producing more than twice as much energy per gram as do the carbohydrates. They thus, represent an economical food reserve in the body.
7. The wax lipids form a waterproof protective coating on animal furs, plant stem, leaves, and fruits.

Question 3.
How does water help in maintaining the constancy of the internal environment of an organism?

Answer:
Some substances, capable of neutralizing acids or bases, remain in solution in the cytoplasm as extracellular fluids, e.g., bicarbonate (HCO_3), carbonic acid, dibasic phosphate (HPO_4^{-2}). Acids and bases mix in the body fluids with these substances and are neutralized by them. Because of its solvent action water aids in keeping a constant pH.

Water also helps in maintaining constant body temperature by eliminating excess heat through the evaporation of sweat. Elimination of waste products through urine also helps in maintaining the constancy of the internal environment of an organism.

Question 4.
What are peroxisomes and phagosomes?

Answer:
Peroxisomes: These were for the first time observed in the kidney of rodents. They are found both in plants and animals. Their size varies from 0.5 to lp in diameter. They are delimited by a single membrane and contain a finely granular matrix. They often possess a central core called nucleoid which may consist of parallel tubules or twisted with strands. Peroxisomes are generally observed in close association with the endoplas¬mic reticulum.

Peroxisomes in different plant and animal cells differ con¬siderably in their enzymatic make-up, but they contain some peroxide-producing enzymes like urate, oxidase, D-amino acid oxidase, B-hydroxy acid oxidase, and catalase. Peroxisomes are somehow associated with some metabolic processes like photorespiration and lipid metabolism in animal cells.

Sphaerosomes: There are cell organelles bounded by a single membrane. They contain enzymes and are visible under the light microscope. These show some affinities for fat stains, including Sudan stain and sodium tetroxide.

These organelles originate from E.R. by budding. They contain enzymatic proteins which help in synthesizing oils and fats. Further devel¬opment of phagosomes takes place through an increase in the lipid content with a concomitant decrease in protein.

Question 5.
Enumerate the importance of Energy carriers.

Answer:
Energy carriers consist of nucleotides having one or two additional phosphate groups linked up at their phosphate end forming diphosphates and triphosphates. Linkage of additional phosphate groups occurs at the cost of a large amount of energy. This energy is provided by the oxidation of food mainly glucose and by photosynthesis.

Separation of the additional phosphate groups from the nucleotides by enzymatic hydrolysis releases a correspondingly large amount of energy.

Thus, ADP and ATP provide ready energy for biological activities.

The bonds joining the additional phosphate groups to the nucleotides are called high energy or energy-rich bonds, as they carry a great deal of energy. The nucleotides having more than one phosphate group are called higher nucleotides.

The energy of energy carriers, when set free is utilized for driving energy-dependent reactions in the cell and is biologically useful energy. ATP is the most common energy carrier in cells and is often called the energy currency of the cell.

Question 6.
Explain the functions of amino acids.

Answer:

1. Amino acids are the building blocks for proteins.
2. The amino acid Tyrosine takes part in the formation of the skin pigment melanin as well as hormones thyroxine and adrenaline.
3. Glycine is important for the formation of heme.
4. Tryptophan takes part in the formation of the vitamin nicotinamide.
5. In plants, tryptophan forms the growth hormone indole-3- acetic acid.
6. Amino acids are converted into glucose by deamination.
7. Histamine and other biogenic amines are formed by the removal of carboxyl groups from amino acids.

Question 7.
Give reasons for following
(i) Salts dissolve in water but oil does not

Answer:
Water molecules are hydrogen-bonded to form short-lived macromolecular aggregates. To dissolve in water, a solute molecule must form hydrogen bonds with water molecules. Salts

are polar compounds, their hydrophilic polar groups form hydrogen bonds with water molecules. So they dissolve oils having hydrophobic non-polar groups that cannot join the lattice structure of water. Thus non-polar molecules of oil do not dissolve in water.

(ii) Amino acid can be basic

Answer:
A free amino group is basic and a free carboxyl group is acidic. Amino acids can be basic because they may carry two amino groups and one carboxyl group e.g., Arginine. One free amino group causes amino acids to be basic.

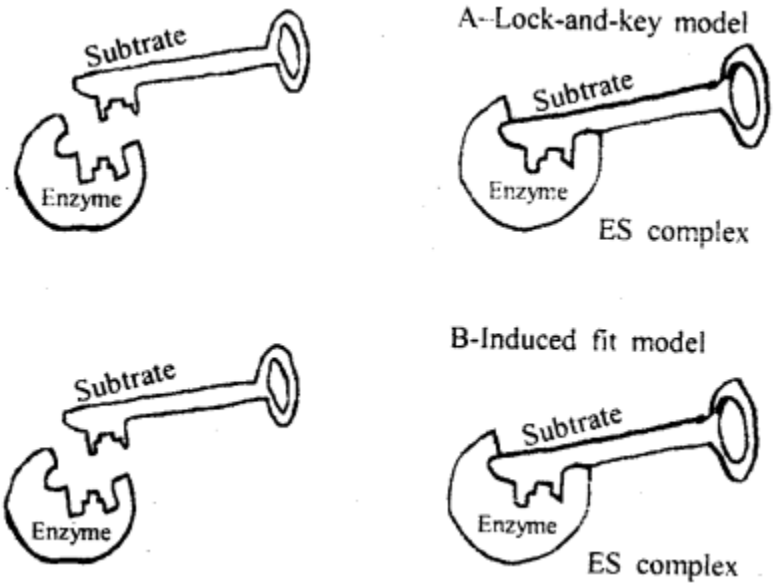
(iii) Phospholipids form a thin layer on the surface of an aqueous medium.
Answer:
Phospholipids form a thin layer on the surface of an aqueous medium due to the simultaneous presence of both polar and non-polar groups in the molecule. As a result, the phospholipid molecules may arrange themselves in a double-layered membrane in aqueous media.

Question 8.
Illustrate lock and key hypothesis of enzyme action?

Answer:
Mechanism of Enzyme action: The working of enzymes is a complex one. All enzymes first of all combine with the reactions they catalyze. In other words, enzymes with substrates form an intermediate complex before decomposition of the substrate can occur.

This two-way reaction can be represented as follows.
1st step: Enzyme substrate complex = Enzyme + Product.
Formation of the enzyme-substrate complex during enzyme action.

From the above, it is clear that the enzymes must combine first with substrate molecules in order to act. In order to explain the mode of action of an enzyme. Fischer proposed a lock and key theory. According to him if the right key fits in the right lock. The lock can be opened, otherwise not.



Model of enzyme activity

To explain the above in context with the enzyme action it is believed that molecules have specific configurations into which other molecules can fit. The molecules which are acted upon by the enzymes are called substrates of the enzymes. Under the above assumption, only those substrate molecules with the proper geometric shape can fit into the active site of the enzymes.

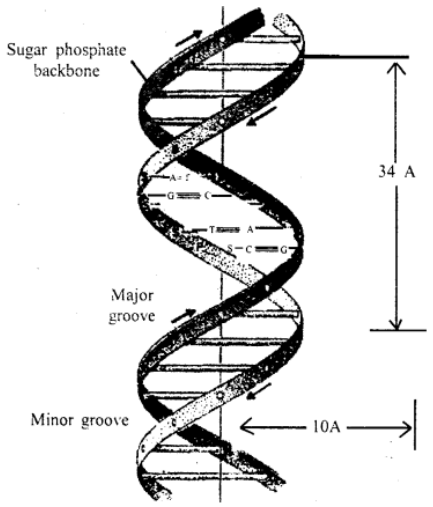
If this happens, the above molecules may compete with the substrate, and the reaction may either slow down or stop. Substances are called competitive inhibitors because they act to prevent the production of a substance.

An induced-fit model of enzyme action was given by Koshland (1959). Buttressing and catalytic are two groups of the active site of the enzyme. Their site when the substrate attaches to its bonds is broken.

Question 9.
What is the structure of DNA?

Answer:
The nucleic acids are among the largest of all molecules found in living beings. They contain three types of molecules (a) 5 carbon sugar, (b) Phosphoric acid (usually called phosphates when in chemical combi¬nation), and nitrogen-containing bases (Purines and Pyrimidines). The three join together to form a nucleotide i.e., sugar+ base + phosphate = Nucleotide. Only a few nucleotides are possible. They differ only in the kind of purines or pyrimidine (nitrogen-containing bases).

In 1953 J.D. Watson and F.H.C. Crick working in Cambridge Uni¬versity, England prepared a model of DNA molecule elucidating the struc¬ture of DNA molecule. They were awarded the Nobel Prize for this outstanding work.

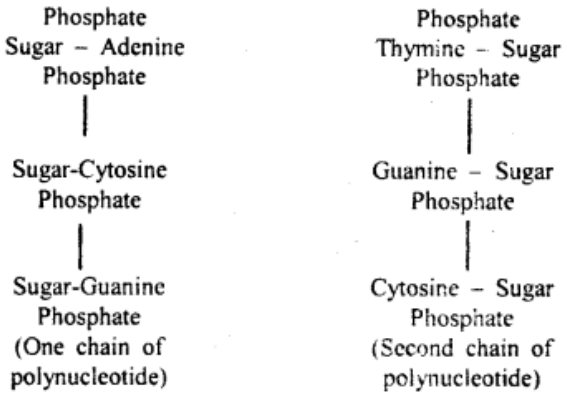


Structure of DNA

Watson and Crick model of DNA: According to Watson and Crick, the DNA molecule consisted of two strands twisted around each other in the form of a helix. Each strand is made of polynucleotides, each polynucleotide consisting of many nucleotides which remain united with its complimentary' chain with the help of bases.

Adenine always unites with thymine and cytosine with guanine. It means that one polynucleotide chain of DNA molecule is complementary to the other.

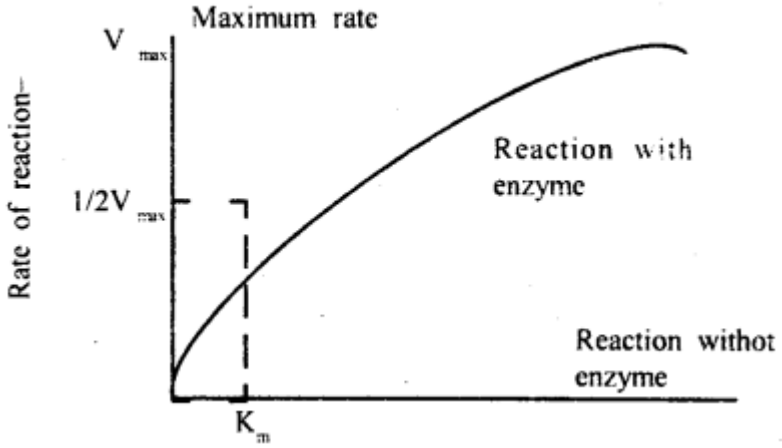
The distance between two chains of the helix is about 20 A and the helix turns over every 34 A. Each mm of the chain consists of about 10 nucleotides.



Structure of DNA

Question 10.
How does the substrate concentration affect the velocity of enzyme reaction?

Answer:
Michaelis constant or more appropriately Michaelis-Menten constant (Km) is a mathematical derivation given by Leonor Michaelis and Monde Menten in 1913 with the help of which velocity of reaction can be calculated for any substrate concentration.



Effect of substrate concentration on enzyme action

Km or Michaelis constant is the substrate concentration at which the chemical reaction attains half its maximum velocity. The constant is an inverse measure of the affinity of an enzyme for its substrate, that is the smaller the Km the greater the substrate affinity and vice versa. The value usually lies between $10^4 – 10^5$ M