# PRACTICE MCQs

CLASS 12 CHEMISTRY (TERM - I)

## BIOMOLECULES

BY

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learning simplified

**Question 1:**

Which one of the following reactions is not explained by the open chainStructureof glucose?

(a) Formation of pentaacetate of glucose with acetic anhydride.

(b) formation of addition product with 2,4 DNP reagent

(c) Silver mirror formation with Tollen's reagent

(d) existence of alpha and beta forms of glucose.

**Answer: (d) existence of alpha and beta forms of glucose.**

Existence of alpha and beta forms of glucose explained by the open chain Structure of glucose.

**Question 2:**

Which of the following statement is correct?

(a) Fibrous proteins are generally soluble in water

(b) Albumin is an example of fibrous proteins

(c) In fibrous proteins, the structure is stabilised by hydrogen bonds and disulphide bonds

(d) pH does not affect the primary structure of protein.

**Answer: (d) pH does not affect the primary structure of protein.**

pH does not affect the primary structure of protein but it affects the tertiary structure.

**Question 3:**

Which of the following is a polysaccharide?

(a) glucose

(b) maltose

(c) glycogen

(d) lactose

**Answer: (c) glycogen**

Glycogen is a polymer of glucose.

**Question 4:**

In which of the following cases blood cells will shrink:

(a) when placed in water containing more than 0.9% (mass/ volume) NaCl solution.

(b) when placed in water containing less than 0.9% (mass /volume) NaCl solution.

(c) when placed in water containing 0.9% (mass/volume) NaCl solution.

(d) when placed in distilled water.

**Answer: (a) when placed in water containing more than 0.9% (mass/ volume) NaCl solution.**

When placed in water containing more than 0.9% (mass/ volume) NaCl solution because fluid inside blood cells is isotonic with 0.9% NaCl solution.

**Question 5:**

Which of the following polymer is stored in the liver of animals?

(a) Amylose

(b) Cellulose

(c) Amylopectin

(d) Glycogen

**Answer: (d) Glycogen**

The carbohydrates are stored in animal body as glycogen. It is also known as animal starch because its structure is similar to amylopectin and is rather more highly branched. It is present in liver, muscles and brain.

**Question 6:**

Proteins are found to have two different types of secondary structures viz. α-helix and β-pleated sheet structure. α-helix structure of protein is stabilised by:

(a) Peptide bonds

(b) van der Waals forces

(c) Hydrogen bonds

(d) Dipole-dipole interactions

**Answer: (c) Hydrogen bonds**

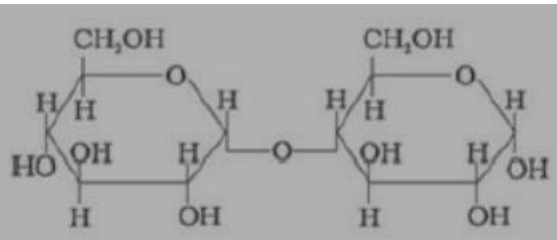
α-helix and β-pleated sheet structure: These structures arise due to the regular folding of the backbone of the polypeptide chain due to hydrogen bonding between >C—O and —NH— group of the peptide bond.

α-Helix is one of the most common ways in which a polypeptide chain forms all possible hydrogen bond by twisting into a right-handed screw (helix) with the -NH group of each amino acid residue hydrogen bonded to the >C=O of an adjacent turn of the helix.

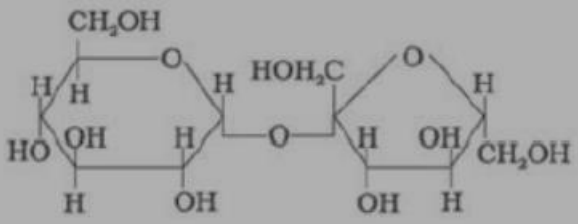
**Question 7:**

In disaccharides, if the reducing groups of monosaccharides i.e., aldehydic or ketonic groups are bonded, these are non-reducing sugars. Which of the following disaccharide is a non-reducing sugar?

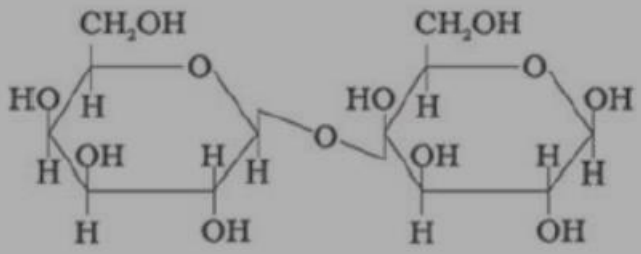
(a)



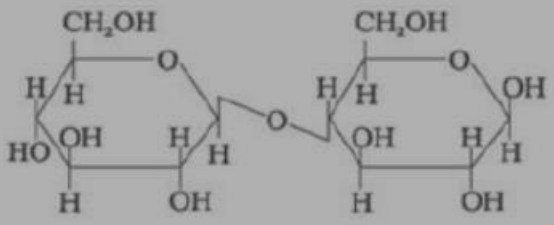
(b)



(c)

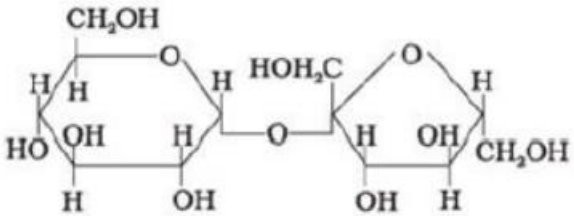


(d)



**Answer:**

(b)



One of the common disaccharides is sucrose which on hydrolysis gives equimolar mixture of D- (+)-glucose and D- (-) fructose. These two monosaccharides are held together by a glycosidic linkage between $C_1$ of α-

glucose and $C_2$ of beta-fructose. Since the reducing groups of glucose and fructose are involved in glycosidic bond formation, sucrose is a non-reducing sugar.

**Question 8:**

Nucleic acids are the polymers of

(a) Nucleosides

(b) Nucleotides

(c) Bases

(d) Sugars

**Answer: (b) Nucleotides**

Nucleic acids are long chain polymers of nucleotides, so they are also called polynucleotides.

**Question 9:**

DNA and RNA contain four bases each. Which of the following bases is not present in RNA?

(a) Adenine

(b) Uracil

(c) Thymine

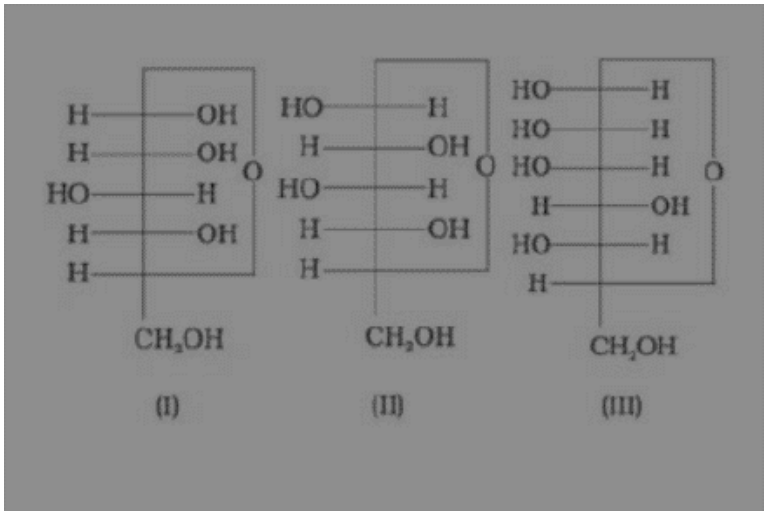
(d) Cytosine

**Answer: (c) Thymine**

DNA contains four bases viz. adenine (A), guanine (G), cytosine (C) and thymine (T). RNA also contains four bases; the first three bases are same as in DNA but the fourth one is uracil (U).

**Question 10:**

Three cyclic structures of monosaccharides are given below which of these are anomers.




(a) I and II

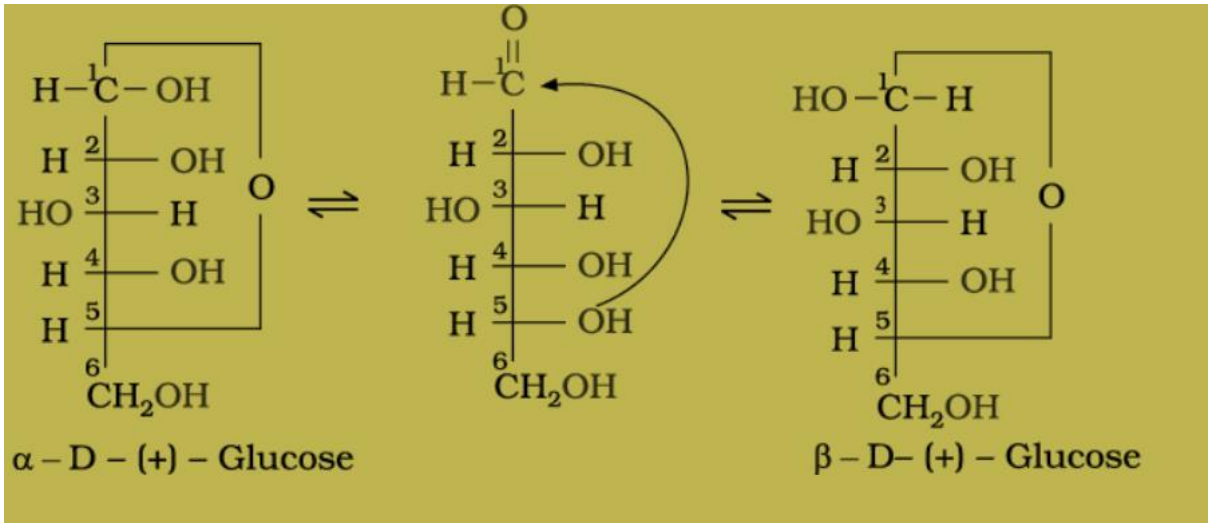
(b) II and III

(c) I and III

(d) III is anomer of I and II

**Answer: (a) I and II**

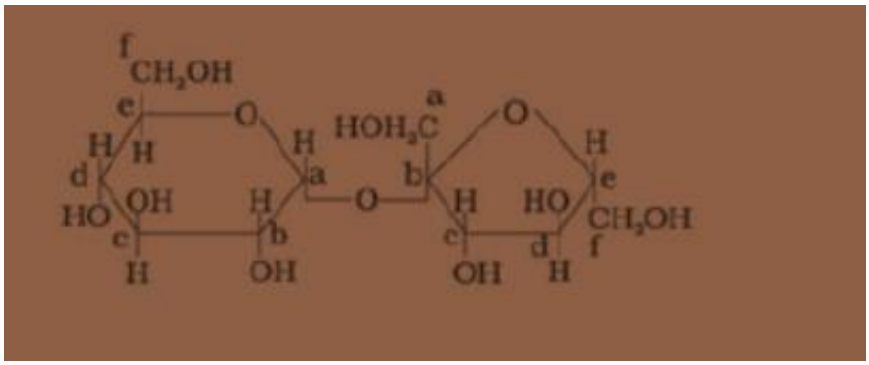
This behaviour could not be explained by the open chain structure (I) for glucose. It was proposed that one of the —OH groups may add to the —CHO group and form a cyclic hemiacetal structure. It was found that glucose forms a six-membered ring in which —OH at C-5 is involved in ring formation. This explains the absence of —CHO group and also existence of glucose in two forms as shown below.




**Question 11:**

Structure of a disaccharide formed by glucose and fructose is given below.

Identify anomeric carbon atoms in monosaccharide units.



(a ‘a’ carbon of glucose and ‘a’ carbon of fructose.

(b) ‘a’ carbon of glucose and ‘e’ carbon of fructose.

(c) ‘a’ carbon of glucose and ‘b’ carbon of fructose.

(d) ‘f’ carbon of glucose and ‘f’ carbon of fructose.

**Answer: (c) ‘a’ carbon of glucose and ‘b’ carbon of fructose.**

Two monosaccharides are held together by a glycosidic linkage between $C_1$ of α-glucose and $C_2$ of β-fructose.

**Question 12:**

Which one of the following statements is correct about sucrose?

(a) It can reduce Tollen's reagent however cannot reduce Fehling's reagent

(b) It undergoes mutarotation like glucose and fructose

(c) It undergoes inversion in the configuration on hydrolysis

(d) It is laevorotatory in nature.

**Answer: (c) It undergoes inversion in the configuration on hydrolysis**

Sucrose undergoes inversion in the configuration on hydrolysis.

**Question 13:**

A D-carbohydrate is:

(a) Always dextrorotatory

(b) Always laevorotatory

(c) Always the minor of the corresponding L-carbohydrate

(d) None of these

**Answer: (d) None of these**

Option (d) None of these. In these three no one is the D- carbohydrate.

Option (a) Always dextrorotatory

A D-carbohydrates is not always dextrorotatory.

So, it is incorrect.

Option (b) is incorrect

Option (b) Always laevorotatory

A D- carbohydrates is not always laevorotatory.

So, it is incorrect.

Option (c) is incorrect

(c) Always the mirror of the corresponding L- carbohydrate

A D- carbohydrates is not always the mirror of the corresponding L-Carbohydrate.

So, this option is incorrect.

**Question 14:**

When the number of amino acids is more than 10, then the product called _____.

**Answer: When the number of amino acids is more than 10, then the product called polypeptide.**

When more than ten amino acids react with each other the product formed is called Polypeptide.

## Assertion Reason Based Questions

**In the following questions from 15 to 18 a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.**

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

**Question 15:**

**Assertion (A):** Desmolysing enzymes are those which catalyse the reactions by hydrolysis.

**Reason (R): Digestive enzymes are hydrolysing in nature.**

**Answer: (d) A is false but R is true.**

Desmolysing enzymes are those which catalyse reactions by the other methods other than hydrolysis, e.g., aldolases, dehydrogenases, oxidases, etc. Digestive enzymes function by catalysing hydrolysis. Larger molecules are broken into smaller ones. They are grouped into three types - proteolytic (breaks protein molecule), amylolytic (breaks sugar molecule) and lipolytic (breaks lipid molecule).

**Question 16:**

**Assertion (A):** Enzymes are defined as biological proteins.

**Reason (R):** Chemically all enzymes are globular proteins.

**Answer: (a) Both A and R are true and R is the correct explanation of A**

All biological reactions are catalysed by special catalysis called enzyme; thus, enzymes are defined as biological proteins. Also, enzymes are small organic molecules which are weakly held to the protein and can be easily separated by dialysis. Therefore, chemically all enzymes are globular proteins.

**Question 17:**

**Assertion (A):** DNA molecules and RNA molecules are found in the nucleus of cell.

**Reason (R):** On heating, enzymes do not lose their specific activity.

**Answer: (d) A is false but R is true.**

DNA molecules are found primarily in the nucleus of the cell but RNA molecules are found outside the nucleus. By heating, its special structural arrangement is changed irreversibly, this result in the conversion of enzyme into a fibrous or insoluble form. Due to this irreversible change, enzymes lose their specific activity when heated.

**Question 18:**

**Assertion (A):** The two strands of DNA are complementary to each other

**Reason (R):** The hydrogen bonds are formed between specific pairs of bases.

**Answer: (a) Both A and R are true and R is the correct explanation of A**

Two DNA strands are complementary to each other. Adenine forms hydrogen bond with thymine and guanine base pairs with cytosine. They follow base complementary rule.

**Question 19:**

Invert sugar is:

(a) A type of cane sugar

(b) Optically inactive form of sugar

(c) Mixture of glucose and galactose

(d) Mixture of glucose and fructose in equimolar quantities.

**Answer: (d) Mixture of glucose and fructose in equimolar quantities.**

Sucrose which is an equimolar mixture of glucose and fructose on hydrolysis brings about a change in the sign of rotation from dextro (+) to laevo (-) and the product is named as invert sugar.

Hence, invert sugar is a mixture of glucose and fructose in equimolar quantities.

**Question 20:**

The sequence in which amino acids are linked to one another in a protein molecule is called its:

(a) Primary structure

(b) Secondary structure

(c) Tertiary structure

(d) Quaternary structure

**Answer: (a) Primary structure**

Proteins may have one or more polypeptide chains. Each polypeptide in a protein has amino acids linked with each other in a specific sequence and it is this sequence of amino acids that is said to be the primary structure of that protein.

**Question 21:**

Observation of 'Ruhemann's purple' is a confirmatory test for the presence of:

(a) Starch

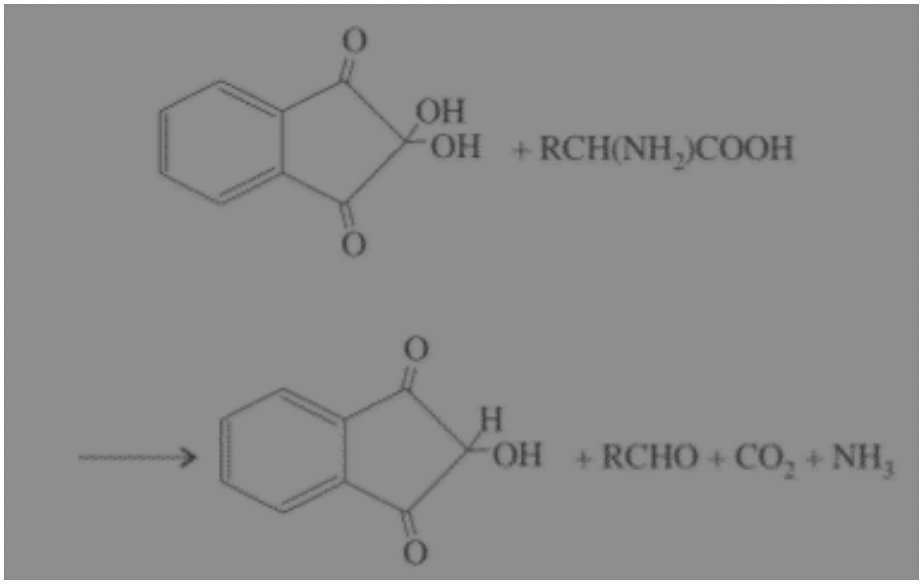
(b) Reducing sugar

(c) Protein

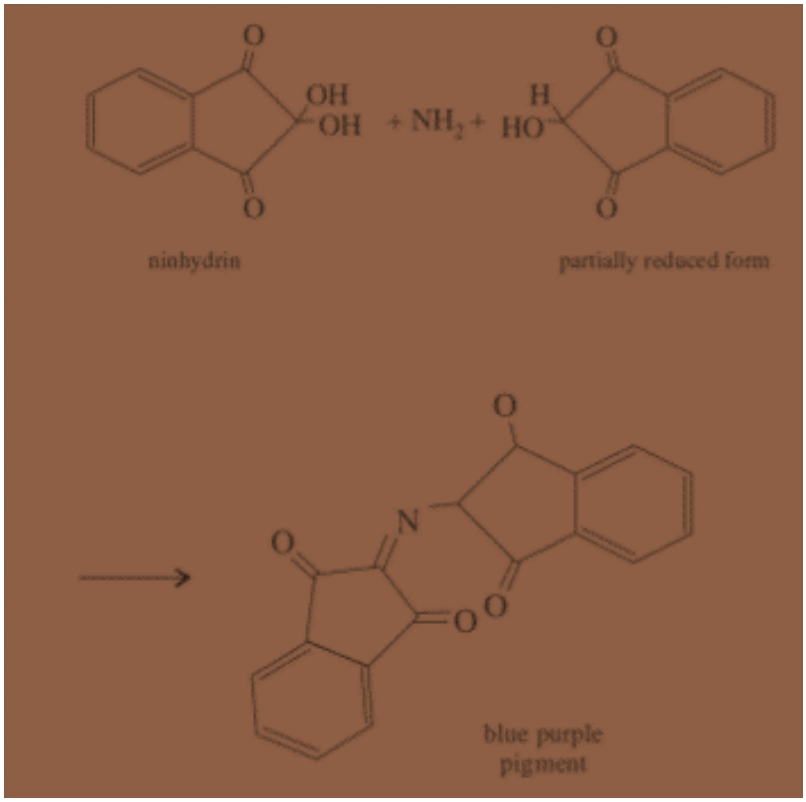
(d) Cupric ion

**Answer: (c) Protein**

Ninhydrin (2,2-dihydroxyindane-1,3-dione) is a chemical used to detect alpha amino acids and also free amino acids and carboxylic acid groups on proteins and peptides. When about 0.5 mL of a 0.1% solution of ninhydrin is boiled with few mL of amino acid or protein solution a blue colour develops. Ninhydrin degrades amino acids into aldehydes, ammonia and $CO_2$ through a series of reactions, the net result is ninhydrin in a partially form of hydrindatin.




Ninhydrin then condenses with ammonia and hydrindatin to produce an intensely blue or purple pigment, sometimes called 'Ruhemann's purple'.




**Question 22:**

Which of the following B group vitamins can be stored in our body?

(a) Vitamin $B_1$

(b) Vitamin $B_2$

(c) Vitamin $B_6$

(d) Vitamin $B_{12}$

**Answer: (d) Vitamin $B_{12}$**

Water soluble vitamins must be supplied regularly in diet because they are readily excreted in urine and cannot be stored (except vitamin $B_{12}$) in our body.

**Question 23:**

Which of the following statements regarding DNA fingerprinting is incorrect?

(a) It is used in forensic laboratories for identification of criminals.

(b) It cannot be altered by surgery.

(c) It is different for every cell and cannot be altered by any known treatment.

(d) It is used to determine paternity of an individual.

**Answer: (c) DNA fingerprinting cannot be used for paternity testing**

DNA fingerprinting is same for every cell and cannot be altered by any known treatment.

## Case-Study Based Questions

**Question 24:**

Read the passage given below and answer the following questions:

Adenosine triphosphate (ATP) is the energy-carrying molecule found in the cells of all livingthings. ATP captures chemical energy obtained from the breakdown of food molecules andreleases it to fuel other cellular processes. ATP is a nucleotide that consists of three mainstructures: the nitrogenous base, adenine; the sugar, ribose; and a chain ofthree phosphate groups bound to ribose. The phosphate tail of ATP is the actual power sourcewhich the cell taps. Available energy is contained in the bonds between the phosphates and isreleased when they are broken, which occurs through the addition of a water molecule (aprocess called hydrolysis). Usually only the outer phosphate is removed from ATP to yieldenergy; when this occurs ATP is converted to adenosine diphosphate (ADP), the form ofthe nucleotide having only two phosphates.The importance of ATP (adenosine triphosphate) as the main source of chemical energy inliving matter and its involvement in cellular processes has long been recognized. The primarymechanism whereby higher

organisms, including humans, generate ATP is throughmitochondrial oxidative phosphorylation. For the majority of organs, the main metabolic fuel is glucose, which in the presence of oxygen undergoes complete combustion to $CO_2$ and $H_2O$:

$C_6H_{12}O_6 + 6O_2 \rightarrow 6O_2 + 6H_2O$ + energy

The free energy (ΔG) liberated in this exergonic (ΔG is negative) reaction is partially trappedas ATP in two consecutive processes: glycolysis (cytosol) and oxidative phosphorylation(mitochondria). The first produces 2 mol of ATP per mol of glucose, and the second 36 molof ATP per mol of glucose. Thus, oxidative phosphorylation yields 17-18 times as muchuseful energy in the form of ATP as can be obtained from the same amount of glucose by glycolysis alone.

The efficiency of glucose metabolism is the ratio of amount of energy produced when 1 molof glucose oxidised in cell to the enthalpy of combustion of glucose. The energy lost in theprocess is in the form of heat. This heat is responsible for keeping us warm.

1. Cellular oxidation of glucose is a:

(a) spontaneous and endothermic process

(b) non spontaneous and exothermic process

(c) non spontaneous and endothermic process

(d) spontaneous and exothermic process

2. What is the efficiency of glucose metabolism if 1 mole of glucose gives 38ATPenergy? (Given: The enthalpy of combustion of glucose is 686 kcal, 1ATP= 7.3kcal)

(a) 100%

(b) 38%

(c) 62%

(d) 80%

3.Which of the following statement is true?

(a) ATP is a nucleoside made up of nitrogenous base adenine and ribose sugar.

(b) ATP consists the nitrogenous base, adenine and the sugar, deoxyribose.

(c) ATP is a nucleotide which contains a chain of three phosphate groups bound toribose sugar.

(d) The nitrogenous base of ATP is the actual power source.

4. Nearly 95% of the energy released during cellular respiration is due to:

(a) glycolysis occurring in cytosol

(b) oxidative phosphorylation occurring in cytosol

(c) glycolysis in occurring mitochondria

(d) oxidative phosphorylation occurring in mitochondria

5. Which of the following statements is correct?

(a) ATP is a nucleotide which has three phosphate groups while ADP is a nucleosidewhich three phosphate groups.

(b) ADP contains a nitrogenous bases adenine, ribose sugar and two phosphate groupsbound to ribose.

(c) ADP is the main source of chemical energy in living matter.

(d) ATP and ADP are nucleosides which differ in number of phosphate groups.

**Answer.**

**1. (d) spontaneous and exothermic process**

Cellular oxidation of glucose is a spontaneous and exothermic process.

**2. (b) 38%**

Glucose catabolism yields a total of 38ATP. 38 ATP x 7.3 kcal/mol ATP=262 kcal. Glucose has 686 kcal. Thus, the efficiency of glucose metabolism is (262/686) x100=38%.

**3. (c)**

ATP is a nucleotide which contains a chain of three phosphate groups bound to ribose sugar.

**4. (d)**

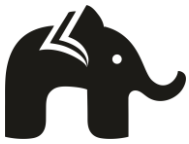
oxidative phosphorylation occurring in mitochondria

**5. (b)**

ADP contains a nitrogenous bases adenine, ribose sugar and two phosphate groups bound to ribose.

**Question 25:**

The basic chemical formula of DNA is now well established. As shown in Figure 1 it consistsof a very long chain, the backbone of which is made up of alternate sugar and phosphategroups, joined together in regular 3' 5' phosphate di-ester linkages. To each sugar is attacheda nitrogenous base, only four different kinds of which are commonly found in DNA. Two ofthese---adenine and guanine---are purines, and the other two thymine and cytosine-arepyrimidines. A fifth base, 5-methyl cytosine, occurs in smaller amounts in certain organisms,and a sixth, 5-hydroxy-methyl-cytosine, is found instead of cytosine in the T even



phages. Itshould be noted that the chain is unbranched, a consequence of the regular internucleotidelinkage. On the other hand, the sequence of the different nucleotides is, as far as can beascertained, completely irregular. Thus, DNA has some features which are regular, and somewhich are irregular. A similar conception of the DNA molecule as a long thin fibre isobtained from physicochemical analysis involving sedimentation, diffusion, light scattering,and viscosity measurements. These techniques indicate that DNA is a very asymmetricalstructure approximately 20 A wide and many thousands of angstroms long. Estimates of itsmolecular weight currently center between 5 X $10^6$ and $10^7$(approximately 3 x$10^4$nucleotides). Surprisingly each of these measurements tend to suggest that the DNA isrelatively rigid, a puzzling finding in view of the large number of single bonds (5 pernucleotide) in the phosphate-sugar back bone. Recently these indirect inferences have beenconfirmed by electron microscopy

1. Purines present in DNA are:

(a) adenine and thymine

(b) guanine and thymine

(c) cytosine and thymine

(d) adenine and guanine

2. DNA molecule has _____ internucleotide linkage and _____ sequence of thedifferent nucleotides.

(a) regular, regular

(b) regular, irregular

(c) irregular, regular

(d) irregular, irregular

3. DNA has a _____ backbone

(a) phosphate -purine

(b) pyrimidines- sugar

(c) phosphate- sugar

(d) purine- pyrimidine

4. Out of the four different kinds of nitrogenous bases which are commonly found in DNA,_____ has been replaced in some organisms.

(a) adenine

(b) guanine

(c) cytosine

(d) thymine

**Answer:**

**1. (d) adenine and guanine**

Purines present in DNA are adenine and guanine

**2. (b) regular, irregular**

DNA molecule has regular internucleotide linkage and irregular sequence of thedifferent nucleotides.

**3. (c) phosphate- sugar**

DNA has a phosphate- sugar backbone.

**4. (d) thymine**

Out of the four different kinds of nitrogenous bases which are commonly found in DNA, thymine has been replaced in some organisms.

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