SAMPLE CONTENT

Precise

BIOLOGY

Pappus

Pappus is a modification of sepals into hairy structures. Pappus calyx is persistent and helps in dispersal of fruits.

STD. XI Sci.

Target Publications Pvt. Ltd.

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STD. XI Sci.
Precise Biology

Salient Features

- Concise coverage of syllabus in Question Answer Format.
- Covers answers to all Textual Questions.
- Quick Review for instant revision and summary of the chapter.
- Exercise, Multiple Choice Questions and Topic test at the end of each chapter for effective preparation.

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Preface

In the case of good books, the point is not how many of them you can get through, but rather how many can get through to you.

"Std. XI Sci. : PRECISE BIOLOGY" is a complact yet complete guide designed to boost students' confidence and prepare them to face the conspicuous Std. XI final exam.

This book is specifically aimed at Maharashtra Board students. The content of the book is framed in accordance with Maharashtra State board syllabus and collates each and every important concept in question and answer format.

This book has been developed on certain key features as detailed below:

- **Question and Answer** format of the book provides students with appropriate answers for all textual questions.
- **Quick Review** section facilitates instant revision.
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- **Multiple Choice Questions** and **Topic Test** assess the students on their range of preparation and the amount of knowledge of each topic.

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A book affects eternity; one can never tell where its influence stops.

Best of luck to all the aspirants!

Yours faithfully,
Publisher

Edition: First

Contents

Note: All the Textual questions are represented by * mark.
All NCERT questions are represented by # mark.

03 Biochemistry of Cell

Syllabus

3.0 Introduction

***Q.1. Write a short note on cellular pool.**

Ans: Cellular pool:

i. There are different types of materials present in the cell which make it possible to carry on all metabolic activities. This collection of various types of molecules in a cell is known as cellular pool.

ii. It consists of inorganic material and organic compounds.

iii. Inorganic material includes water, salts and mineral ions; while organic compounds are carbohydrates, proteins, lipids, nucleic acids, etc.

iv. All the molecules in a cellular pool help in metabolic activities of the cell.

#Q.2. What are macromolecules? Give examples.

Ans: i. Macromolecules are large sized compounds with high molecular weight but poorly soluble in water.

ii. Examples: Proteins, polysaccharides, nucleic acids, etc.

3.1 Basic chemical constituents of cell

***Q.3. What are carbohydrates? Give the classification of carbohydrates.**

Ans: Carbohydrates:

Carbohydrates are organic compounds containing carbon, hydrogen and oxygen. Plants are the major source of carbohydrates as they produce carbohydrates during photosynthesis.

The general formula of simple carbohydrates is $C_nH_{2n}O_n$ and complex carbohydrates is $(C_6H_{10}O_5)n$

Some carbohydrates like rhamnose and digitoxose do not follow general formula of carbohydrates. Simple carbohydrates are commonly known as sugars which are involved in metabolic reactions, whereas complex carbohydrates form structural units.

Classification:

Based on their structure, carbohydrates are classified as follows:

Carbohydrates

- **Monosaccharides**
  - They are simple sugars and cannot be broken down into smaller units.
  - Further classified on the basis of no. of carbon atoms:
    - **Trioses** (3C) e.g. Glyceraldehyde
    - **Tetroses** (4C) e.g. Erythrose
    - **Pentoses** (5C) e.g. Ribose
    - **Hexoses** (6C) e.g. Glucose
    - **Heptoses** (7C) e.g. Sedoheptulose
- **Disaccharides**
  - They are formed by condensation of two monosaccharides.
- **Polysaccharides**
  - They are formed by large number of monosaccharides.
  - Further classified into two broad groups:
    - **Homopolysaccharide or homoglycan** They contain only one type of monosaccharide.
    - **Heteropolysaccharides or Heteroglycan** They contain different types of monosaccharides.

Q.4. Write short notes on:

***i. Monosaccharides ii. Disaccharides iii. Polysaccharides**

Ans: i. Monosaccharides:

Monosaccharides are the basic units of complex carbohydrates.
Monosaccharides cannot be further hydrolyzed into smaller units.
They are simple sugars with potentially free aldehyde or ketone groups.
They are crystalline, soluble in water and sweet to taste.
Monosaccharides are further classified as aldoses and ketoses, depending on the presence of aldehyde or ketone as functional group.
Monosaccharides with ketone group are called ketose sugars. e.g. ribulose, fructose; while those with aldehyde group are called aldose sugars. e.g. glucose, xylose, etc.
According to the number of C-atoms they possess, they are further classified as

Example: Triose (3C) – Glyceraldehyde – $C_3 H_6 O_3$
Tetrose (4C) – Erythrose – $C_4 H_8 O_4$
Pentose (5C) – Deoxyribose – $C_5 H_{10} O_4$ and ribose sugars – $C_5 H_{10} O_5$
Hexose (6C) – Glucose, fructose – $C_6 H_{12} O_6$
Heptose (7C) – Sedoheptulose – $C_7 H_{14} O_7$

ii. Disaccharides:

They are composed of two monosaccharides.
They can be further hydrolyzed into monosaccharides.
They are soluble in water, sweet in taste and crystalline.
The linkage between two monosaccharide sugar molecules to form a disaccharide is called a glycosidic linkage or glycoside bond.
When two sugar molecules get linked, one water molecule is formed.
Example: Lactose, sucrose, maltose, etc.

iii. Polysaccharides:

Complex carbohydrates are formed by the condensation of large number of monosaccharides.
They can be easily hydrolyzed.
They are amorphous, tasteless and insoluble in water.
General formula of polysaccharide is $(C_6H_{10}O_5)_n$. Here, 'n' represents number of monosaccharide links.

They are classified into two types:

a. Homopolysaccharides or homoglycans:

It contains same type of monosaccharides.
Example: Starch, cellulose, glycogen, pectin, agar.

b. Heteropolysaccharides or heteroglycans:
They consist of different types of sugar or sometimes non-sugar components also.
Example: Hemicellulose, mucilage, heparin.

***Q.5. What is the main role of carbohydrates ?**
Ans: Main role of carbohydrates is to provide energy to the body for metabolism.

***Q.6.Give the role of carbohydrates.**
Ans: Role of carbohydrates:
i. The most important function of carbohydrates is to provide energy to the body for metabolism. Glucose supplies the immediate energy to the body. One gram of carbohydrate on oxidation yields on an average four calories. In plants, starch is the reserved food, while in man glycogen is the reserved food.
ii. Monosaccharides like glucose is the main substrate for synthesis of ATP.
iii. Carbohydrates are the structural components of cell membrane and cell wall.
iv. Cell wall of plants consists of cellulose and pectin.

Q.7. Who coined the term 'protein'?
Ans: Berzelius (1830) coined the term 'protein'.

Q.8. Explain about the formation of a protein molecule.
Ans: i. The basic building blocks of proteins are amino acids.
ii. In a long chain of amino acids forming a protein, the amino group ($-NH_2$) of one amino acid is linked to the carboxyl (–COOH) group of the other amino acid.
iii. Two amino acids are condensed by removal of a water molecule (OH from COOH and H from NH_2) to form a peptide linkage.
iv. The remainder of each amino acid after removal of water molecule (H^+ and OH^-) is called residue.
v. A molecule of a protein made up of two amino acid residues is called a dipeptide, of three residues are tripeptide and of many residues as polypeptide.
vi. Each polypeptide, i.e. a long chain of amino acids contain free amino group ($-NH_2$) at one end and carboxyl (–COOH) group at the other end called N–terminal and C–terminal respectively.
vii. During elongation of polypeptide chain, a new amino acid can be added at either end due to free amino or carboxyl group.

***Q.9. How amino acids are linked to form a long chain?**
Ans: In a long chain of amino acids, the amino group ($-NH_2$) of one amino acid is linked by peptide linkage to the carboxyl group (–COOH) of the other amino acid.

***Q.10.Give the classification of proteins.**
Ans: Proteins are classified into two main types depending upon the chemical composition:
i. Simple proteins ii. Conjugated proteins
i. Simple proteins: They are made up of amino acids or their derivatives. There are different groups included in simple proteins.
e.g. Albumin, globulin, histones, zein from maize .
ii. Conjugated proteins: They consist of simple proteins (amino acids) in combination with some non-protein component. The non-protein part is called prosthetic group.
e.g.
a. Lipoproteins (Proteins + Lipids), e.g. egg yolk, serum
b. Nucleoproteins (Protein + Nucleic acid).
c. Glycoproteins (Proteins + Carbohydrates), e.g. mucin of the saliva.
d. Chromoproteins (Proteins + Pigment) e.g. Cytochrome, haemoglobin

***Q.11.What are proteins? Describe different biological functions of proteins.**
Ans: Proteins:
Proteins are the long chain polymers of amino acids and possess high molecular weight. They contain C, H, O and N. The presence of N distinguishes them from carbohydrates and lipids. Some proteins contain sulphur, while few proteins contain phosphorus also. Cells contain a large number of proteins.

Biological functions of proteins:

The biological importance of proteins is as follows:

i. **Membrane proteins:** Cell membrane consists of proteins and lipids. All membrane bound cell organelles have lipids and proteins in their membranes.

ii. **Enzymes:** All enzymes are proteins. Enzymes may contain some other non-protein part also along with protein. e.g. Amylase.

iii. **Hormones:** Hormones are proteins. They play an important role in the regulation of metabolic reactions in the body. e.g. Insulin, thyroxine.

iv. **Transport protein:** Haemoglobin which is present in RBC of man is a type of protein. It is useful for transportation of oxygen.

v. **Contractile protein:** Muscle fibres consist of proteins, which help in contraction. e.g. Myosin.

vi. **Structural protein:** These proteins form parts of cells or tissues. e.g. Keratin is present in hair and skin, while elastin is present in connective tissue.

vii. **Defensive proteins:** Useful for the protection of body. e.g. Immunoglobin, thrombin for clotting of blood.

***Q.12.Why plant fats are liquid at room temperature while animal fats are solid?**

Ans: i. Plant fats are unsaturated fatty acids, whereas animal fats are saturated fatty acids.

ii. Fats having unsaturated fatty acids are liquid at room temperature.

iii. Saturated fatty acids are solid at room temperature.

iv. Hence, plant fats are liquid at room temperature, while animal fats are solid.

***Q.13. Describe different types of lipids. Add a note on their role.**

Ans: Lipids are classified into three main types:

i. Simple lipids ii. Compound lipids iii. Derived lipids

i. **Simple lipids:**

These are esters of fatty acids with alcohol. Fatty acid is a long straight chain of carbon atoms with a carboxyl group (–COOH) at one end. Monoglycerides have one molecule of fatty acid, diglycerides have two and triglycerides have three molecules of fatty acids.

The fatty acids are of two types:

a. **Saturated fatty acid:**

These fatty acids do not have double bond between carbon atoms of its chain and consists of maximum possible hydrogen atoms. e.g. Stearic acid, palmitic acid, etc.

b. **Unsaturated fatty acid:**

These fatty acids contain one or more double bonds in between carbon atoms of its chain. e.g. Oleic acid. These acids are not fully saturated with hydrogen atoms.

Fats containing unsaturated fatty acids are liquids at room temperature and are called oils.

ii. **Compound lipids:**

These lipids contain some additional element or groups in addition to fatty acids and alcohol such as nitrogen, phosphorus, sulphur, protein, etc. e.g. Phospholipids, glycolipids.

iii. **Derived lipids:**

These are the hydrolytic products of lipids. Lipids include steroids, waxes, carotenoids, essential oils, etc.

a. **Steroids:**

Each molecule of steroid has carbon atom arranged in four interlocking rings. Cholesterol, bile salts, male and female sex hormones are some of the biologically important steroids.

b. **Waxes:**

Plant waxes are esters of saturated fatty acids with long chain alcohols (other than glycerol) and ketone. These are secreted by epidermis and present on stem, fruit and leaves. In animals, feathers and fur are coated with wax.

c. **Carotenoids:**

These are pigments, which are present in the thylakoids of chloroplasts and chromoplasts of almost all higher plants. e.g. Alpha and beta carotene, xanthophylls, etc.

Biological function of lipids:

i. Lipids are reserved food material providing energy to the body. Lipids give more amount of energy to the body after oxidation. One gm lipid produces 9.0 Kcal of heat.

ii. The cell membrane consists of lipids along with proteins.

iii. Some lipids act as components of some enzyme systems.

iv. Fats are present in subcutaneous tissue which acts as insulator for heat.
v. Some lipids are important as vitamins.
vi. Waxes found in animal tissues are esters of fatty acids and provides water proofing and check the rate of transpiration in plants.
vii. Cholesterol takes part in the synthesis of vitamin D and is precursor of many sex hormones.

***Q.14.What are saturated fatty acids ?**

Ans: Fatty acids not having double bond between carbon atom of its chain and consist of maximum possible hydrogen atoms are called as saturated fatty acids.

Q.15. How many types of nucleic acids are present in the nucleus?

Ans: There are two types of nucleic acids present in the nucleus:

i. **DNA:** Deoxyribose nucleic acid **ii.** **RNA:** Ribose nucleic acid

***Q.16.What are nucleic acids? Give a brief account of DNA.**

Ans: **Nucleic acids:**

Nucleic acids are macromolecules composed of many small units or monomers called nucleotides.

Each nucleotide is formed of three components i.e pentose sugar, a nitrogen base and a phosphate (phosphoric acid). When sugar combine with nitrogenous base it forms nucleoside. Nucleotides can be called as nucleoside phosphate. The nucleotides are phosphoric esters of nucleosides.

There are two types of nucleic acids, i.e. DNA and RNA.

Brief account of DNA:

i. DNA is a genetic material of a cell. It is double stranded helix. Each strand of helix is made up of deoxyribose nucleotides.
ii. These nucleotides are linked with each other by phosphodiester bonds.
iii. Two strands of DNA molecule are parallel, complementary and joined by weak hydrogen bonds.
iv. Nitrogen bases are complementary, i.e. A = T, G ≡ C.
v. Each nucleotide is made up of deoxyribose sugar which is a pentose sugar, phosphoric acid and nitrogenous base. The acidic nature of DNA is due to phosphoric acid.
vi. Two strands of DNA are antiparallel and complementary to each other. Adenine and thymine are paired with each other and cytosine is paired with guanine.
vii. Double hydrogen bond is present between adenine and thymine and triple hydrogen bond is present between cytosine and guanine.
viii. Purine: Pyrimidine ratio is 1:1.

Q.17. Who proposed the double helix structure of DNA?

Ans: Watson and Crick proposed the double helix structure of DNA.

Q.18. Where is DNA located in the eukaryotic cell? What are its functions?

Ans: **Location:** DNA is situated mainly in the nucleus, but also occurs in mitochondria and chloroplasts.

Function: It is the genetic material and contains all the information needed for development and existence of an organism.

Q.19. Describe the structure of RNA. Also, mention its types.

Ans: **Structure:**

RNA (Ribonucleic Acid) is a single stranded structure having fewer nucleotides as compared to DNA.

The strands may be straight or variously folded upon itself.

It is made up of nucleotides.

Each nucleotide consists of ribose sugar (5C), nitrogen base and phosphate.

Nitrogen bases are of two types: purine and pyrimidine. Adenine and guanine are two types of purines. Cytosine and uracil are two types of pyrimidines.

Types of RNA:

There are two main types of RNA:

i. Genetic RNA: Present in most plant viruses and some animal viruses.
ii. Non-genetic RNA: It is of three types: mRNA, rRNA and tRNA.
Non-genetic RNA is responsible for protein synthesis in the cell.

***Q.20.What is genetic RNA?**

Ans: When RNA acts as genetic material as in plant viruses and some animal viruses, it is known as genetic RNA.

***Q.21.Describe non genetic RNA types.**

Ans: The non genetic RNA is present in organisms where DNA is the genetic material. The non genetic RNA is of the following types:

Non-genetic RNA
- m-RNA
- r-RNA
- t-RNA

i. m-RNA (Messenger RNA):

a. Messenger RNA forms 5% of the total RNA.
b. It is always single stranded, linear molecule.
c. It is produced from DNA. The process of formation of m-RNA from DNA is called transcription.
d. **Function:** It carries the genetic message from DNA to ribosomes, which are the sites of protein synthesis.

ii. r-RNA (Ribosomal RNA):

a. Ribosomal RNA, as the name suggests, is found associated with the ribosome.
b. It comprises about 80% of total cell RNA.
c. It is single stranded but folded upon itself in some regions. In some regions, nitrogen base pairing may be observed.
d. **Function:** It provides proper binding site for m-RNA during protein synthesis.

iii. t-RNA (Transfer RNA):

a. t-RNA is also called soluble RNA (s-RNA).
b. It is about 10 – 15% of the total cell RNA.
c. It is the smallest RNA.
d. It is either hair-pin like or clover leaf like structure.
e. A particular t-RNA carries a specific activated amino acid from cytoplasm to ribosome which is the site for protein synthesis.
f. **Function:**It helps in elongation of polypeptide chain during the process called translation.

***Q.22.Why is purine : pyrimidine ratio 1 : 1 in DNA while it is not so in RNA?**

Ans: DNA is a double stranded molecule which is stabilized by the constant purine-pyrimidine ratio, whereas RNA is a single stranded molecule. Hence, the purine : pyrimidine ratio is not 1: 1 in RNA.

Q.23. Distinguish between DNA and RNA.

Ans:

No.	DNA	RNA
i.	It is a genetic material of majority of the organisms.	It is a genetic material of some viruses.
ii.	It is double stranded.	It is single stranded.
iii.	Deoxyribose sugar is present.	Ribose sugar is present.
iv.	Thymine is present as one of the pyrimidine base.	Uracil is present as one of the pyrimidine base.
v.	Specific base pairing is observed.	Nitrogen bases do not form pair.
vi.	Total number of purine is equal to total number of pyrimidine. Thus, purine to pyrimidine ratio is 1:1.	Amount of purine and pyrimidine may or may not be equal.
vii.	It is present in nucleus.	It is present in nucleus and cytoplasm.
viii.	It is responsible for determining hereditary characters and for formation of RNA.	It takes part in protein synthesis.

3.2 Enzymes

Q.24. Who coined the term 'enzyme'?

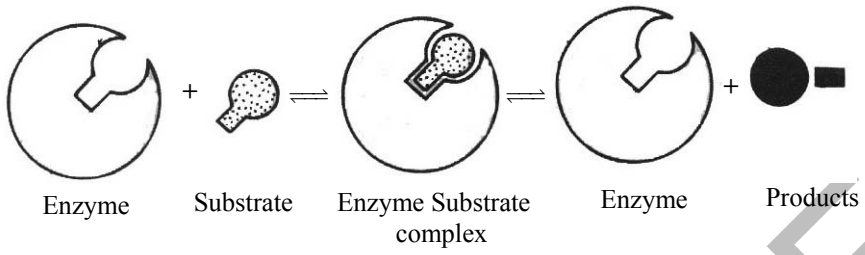
Ans: The term 'enzyme' was coined by William Kuhne (1878) while working on fermentation. [Greek: En – in; zyma – yeast]

Q.25. Discuss the mechanism of enzyme action.

Ans: i. It is explained by lock and key theory.

ii. According to this postulate, lock is the enzyme and key is the substrate. Only key with correctly positioned structure fits into key hole (i.e. active site) of enzyme.

iii. As specific key fits into specific lock, in the similar way specific enzyme reacts with specific substrate molecule.



iv. The substrate (S) binds to the active site of the enzyme (E) and ES complex is formed.

v. This induces the enzyme to alter its shape, fitting more tightly around S.

vi. Active site breaks the chemical bonds of S and new EP (product) complex is formed.

$$\underset{\text{Enzyme}}{E} + \underset{\text{Substrate}}{S} \Rightarrow \underset{\text{Enzyme Substrate complex.}}{ES} \Rightarrow \text{Enzyme} + \text{Products}$$

vii. Enzyme releases the P and free E is ready to bind another molecule of S to repeat the cycle. (It is assumed that the substrate plays a role in determining the final shape of the enzyme. It induces E to alter its shape.

Q.26. Give the classification of enzymes with examples.

Ans: Enzymes are classified into six classes:

Oxidoreductase	Oxidase and dehydrogenase are the enzymes that bring about oxidation. reduction reaction. e.g. NAD oxidoreductase.
Transferases	They transfer functional group such as amino, methyl, phosphate from one substance to the other. e.g. Hexokinase,transaminase.
Hydrolases	They bring about hydrolysis of ester, ether, peptide bond, glycosidic bonds, C-C bonds e.g. Alkaline phosphatase
Lyases	They catalyze removal of a group from their substrate without hydrolysis. e.g. Fumarase and aldolase
Isomerases	Causes catalytic interconversions of geometric,optical and positional isomers. e.g. Phospho hexose isomerase,triose-phospho-isomerase.
Ligases	Helps in joining the two molecules. e.g. acetyl CoA carboxylase , succinic thiokinase are examples of ligases.

***Q.27. What are enzymes? State the general properties of enzymes.**

Ans: Enzymes: An enzyme is a specialized proteinaceous substance produced within an organism which is capable of catalyzing a specific chemical reaction within the cell.

It alters the chemical reaction without undergoing any change itself.

It is also called as biocatalyst.

Properties of enzymes:

i. Role in biochemical reaction:

Enzymes accelerate the reaction, but do not initiate it.

ii. Participation in the reaction:

Enzymes do not participate in the reaction but they remain unchanged at the end of the reaction. Enzymes are therefore required in small amounts. They speed up the reaction.

iii. Active site of enzyme:

The molecule of an enzyme is larger than that of substrate molecule and hence during a reaction a specific part of enzyme molecule comes in contact with the substrate molecule. That part is called active site of an enzyme.

iv. **Amphoteric nature:**
Chemically, most of the enzymes are proteins and therefore show amphoteric nature.
Enzymes can react with acidic substances as well as alkaline substances.

v. **Specificity:**
Most of the enzymes are specific in their action. A single enzyme acts upon a single substrate or a group of closely related substrates.
Example:
a. Enzyme urease can act only upon urea and no other molecule.
b. Enzyme invertase can act upon sucrose only.
A slight change in the configuration of the substrate molecule requires action by a different enzyme.

vi. **Colloidal nature:**
All enzymes are colloidal in nature and thus provide large surface area for reaction to take place.
Colloids (colloids-gel like) are mixtures of two components, i.e. dispersed particles and dispersion medium.
The size of the dispersed particles is larger than the dispersion medium.

vii. **Enzyme optima:**
Enzyme works best under certain defined conditions referred as optima. It includes temperature and pH.

Q.28. Describe the factors affecting enzyme activity.

Ans: Factors affecting the activity of enzymes:

i. **Temperature:**
Enzyme action is greatly affected by temperature.
Enzyme activity increases with increase in temperature upto 40°C. Above 60°C, there is loss of enzyme activity because proteins get denatured.
When the temperature is reduced to freezing point or below freezing point, the enzymes become inactivated but not destroyed. At optimum temperature, rate of reaction is more.

ii. **pH:** Most of the intracellular enzymes function best around neutral pH. Strong acid or strong base denatures (destroys) the enzyme.

iii. **Concentration of enzyme and substrate:** Rate of reaction is directly proportional to concentration of reacting molecules. With the increased concentration of substrate molecules, rate of enzyme reaction also increases upto a certain limit. Beyond a certain point, however, the enzyme becomes saturated with substrate molecules.

iv. **Inhibitors:** Certain compounds combine with an enzyme but do not serve as substrate. They block the action of enzymes and function as inhibitors. The inhibitors usually closely resemble the substrate in structure. They are called competitive inhibitors. Poison like cyanide does not bind the enzyme at substrate binding site but binds at some other site and inhibits the activity of enzyme. Such substances are called non-competitive inhibitors.

***Q.29.What is the active site of an enzyme?**

Ans: Active site of an enzyme is a specific part of an enzyme which comes in contact with the substrate during reaction.

Q.30. Write a note on enzyme inhibitors.

Ans: Enzyme inhibitors are certain chemicals which inhibit enzyme activity.
During the reaction, the active site of enzyme is occupied by these substances instead of substrate molecules and the activity of the enzyme is lost.
There are two basic types of enzyme inhibitors:

i. **Competitive inhibitors:** Competitive inhibitors are substances which are similar to substrate molecules in their structure.

ii. **Non-competitive inhibitors:** Non-competitive inhibitors do not bind with enzyme at substrate binding site, but bind at some other site (prosthetic group) and inhibit the activity of the enzyme. e.g. Cyanide.

Q.31. Define co-factors. Explain it with examples.

Ans: i. Non-protein constituents which make an enzyme catalytically active are called as co-factors.
ii. Prosthetic groups are the cofactors tightly bound to an apoenzyme.
iii. Vitamins are essential chemical components of many coenzymes.
iv. Metal ions are required for activation of certain enzymes.

3.3 Concept of Metabolism

Q.32. Explain the term 'metabolism'.

Ans: i. It is the sum of all processes that take place in each living cell to meet day to day needs.

ii. The two kinds of metabolism are catabolism and anabolism which includes two processes, i.e. catabolic process and anabolic process respectively.

iii. Among these processes, synthetic processes are called anabolic reactions. e.g. production of enzymes.

iv. Catabolic reactions are those in which complex stored products are hydrolyzed to form smaller and simpler molecules. e.g. glycolysis.

v. Anabolic processes consume the energy, while catabolic processes release energy.

Quick Review

Basic chemical constituents of a cell

- Carbohydrates
  - Monosaccharides e.g. Glyceraldehyde, Erythrose, Glucose
  - Disaccharides e.g. Lactose, Sucrose
  - Polysaccharides e.g. Cellulose, Starch
- Proteins
  - Simple e.g. histones, Zein
  - Conjugated e.g. Lipoprotein, Nucleoprotein, Glycoprotein, Chromoprotein
- Lipids
  - Simple lipids
    - Saturated e.g. palmitic acid, stearic acid
    - Unsaturated e.g. oleic acid, linoleic acid
  - Compound lipids e.g. phospholipids, glycolipids
  - Derived lipids
    - Steroids e.g. cholesterol
    - Waxes
    - Carotenoids e.g. α and β-carotene, Xanthophylls
- Nucleic acids
  - DNA
  - RNA
    - Genetic
    - Non-genetic
      - mRNA
      - rRNA
      - tRNA

- **Scientists and their contribution**

No.	Scientists	Contribution	Year
i.	Bloor	Coined the term 'lipid'	1943
ii.	Emil Fischer	Called amino acids as building blocks of the proteins.	–
iii.	Berzelius	Introduced the term protein.	1830
iv.	F. Sanger	Established the sequence of amino acids of insulin which contains 51 amino acids	1955
v.	Fredrick Miescher	Gave the name nuclein to nucleic acid isolated from pus cells.	1869
vi.	Richard Altmann	First to use the term 'nucleic acid.'	1899
vii.	Ascoli, Levine and Jones	Disclosed two kind of nucleic acids DNA and RNA	1900
viii.	Watson and Crick	Put forward the double stranded helical model of DNA molecule	1953
ix.	Kuhne	Coined the term 'enzyme'.	1878
x.	Edward Buchner	Discovered enzyme.	1897

Exercise

One Mark Questions

1. What are non-competitive inhibitors?

Ans: *Refer Q.30 (ii)*

2. Enlist the factors affecting the activity of enzymes.

Ans: *Refer Q.28*

3. What is enzyme optima?

Ans: *Refer Q.27 (vii)*

4. What is the function of ribosomal RNA?

Ans: *Refer Q.21 (ii - d)*

5. What are defensive proteins?

Ans: *Refer Q.11 (vii)*

6. Give any two examples of chromoproteins?

Ans: *Refer Q.10 (ii - d)*

Two Marks Questions

1. Write a short note on m-RNA.
Ans: *Refer Q.21 (i)*

*2. Write a note on derived lipids.
Ans: *Refer Q. 13 (iii)*

3. Write any four biological functions of lipids.
Ans: *Refer Q.13*

4. Justify, "Plant fats are liquid at room temperature while animal fats are solid."
Ans: *Refer Q.12*

5. What are nucleotides made up of?
Ans: *Refer Q.16 (v)*

*6. Write a note on simple lipids.
Ans: *Refer Q. 13 (i)*

7. What role does carbohydrates play in living body?
Ans: *Refer Q. 6*

Three Marks Questions

1. Explain the classification of proteins based on their chemical composition.
Ans: *Refer Q.10*

2. Explain the classification of proteins on the basis of their biological functions.
Ans: *Refer Q.11*

3. With the help of lock and key theory explain the mechanism of enzyme action.
Ans: *Refer Q.25*

4. With the help of suitable examples give any three classes of enzymes.
Ans: *Refer Q.26*

5. Write a note on structure of DNA.
Ans: *Refer Q.16*

6. Why enzymes are said to be amphoteric and specific in their action?
Ans: *Refer Q.27 (iv) and (v)*

7. What are competitive and non-competitive inhibitors?
Ans: *Refer Q.30*

Five Marks Questions

1. a. Write a note on types of non-genetic RNA.
   b. What are co-factors? Give their functions.
Ans: *Refer Q.21*
Refer Q.31

2. a. Define cellular pool.
   b. Write a note on monosaccharides.
   c. Describe the term metabolism.
Ans: a. *Refer Q. 1 (i)*
b. *Refer Q.4 (i)*
c. *Refer Q.32*

#3. Describe the important properties of enzymes.
Ans: *Refer Q.27*

Multiple Choice Questions

*1. Most common constituents of organic compounds found in organisms are
(A) C, H, O, P (B) C, H, O
(C) C, H, N, P (D) C, H, O, N, P

2. Carbohydrates are composed of
(A) carbon (B) hydrogen
(C) oxygen (D) all of these

3. In which of the following, the ratio of hydrogen and oxygen atoms is 2 : 1?
(A) proteins (B) fats
(C) oil (D) carbohydrates

4. Which of the following do not give smaller sugar units on hydrolysis?
(A) Monosaccharides
(B) Disaccharides
(C) Polysaccharides
(D) Glycogen

*5. The simplest monosaccharide made up of three carbons amongst the following is
(A) erythrose (B) glucose
(C) glyceraldehyde (D) ribose

6. Deoxyribose sugar is an example of
(A) monosaccharide
(B) disaccharide
(C) polysaccharide
(D) simple protein

7. Common example/s of hexose sugar is/are
(A) glucose
(B) fructose
(C) erythrose
(D) both (A) and (B)

8. If a compound contains 2 monosaccharides, then it is described as
(A) derived monosaccharide
(B) disaccharide
(C) polysaccharide
(D) pentose sugar

*9. In a disaccharide, monomers are linked with each other through _____ bonds.
(A) peptide (B) hydrogen
(C) glycosidic (D) ester

10. A disaccharide that gives two molecules of glucose on hydrolysis is
(A) sucrose (B) maltose
(C) lactose (D) none of these

11. Sugar present in milk is
(A) fructose (B) lactose
(C) galactose (D) sucrose

12. Polysaccharides consist of
(A) two monosaccharide units
(B) eight monosaccharide units
(C) many monosaccharide units
(D) amino acids

13. The most abundant carbohydrate in nature is
(A) Chitin (B) Glucose
(C) Peptidoglycan (D) Cellulose

14. Proteins are linear polymers of
(A) amino acids
(B) fatty acids
(C) monosaccharides
(D) nucleic acids

*15. Proteins are formed by the condensation of
(A) nucleic acids
(B) amino acids
(C) fatty acids
(D) carbohydrates

16. Protein is
(A) micromolecule
(B) macromolecule
(C) soluble
(D) specific

17. Which of the following is the milk protein?
(A) Lactose
(B) Casein
(C) Insulin
(D) Glucagan

18. Which of the following releases lot of energy on its breakdown?
(A) Carbohydrate (B) Fat
(C) Starch (D) Protein

*19. Simple lipids are esters of
(A) amino acids
(B) proteins
(C) phosphorus
(D) fatty acids with glycerol

20. Keratin is a _____ protein.
(A) transport (B) protective
(C) structural (D) storage

*21. Fatty acids which do not contain double bond between carbon atoms are
(A) saturated fatty acids
(B) unsaturated fatty acids
(C) oleic and linoleic acids
(D) linoleic and linolenic acids

*22. A nucleotide contains
(A) sugar + phosphate
(B) N-base + phosphate
(C) sugar + nitrogenous base
(D) sugar + N-base + phosphate

23. Nucleotides, the polymers of nucleic acid are joined together by _____ bond.
(A) Peptide (B) Ester
(C) Phosphodiester (D) Glycosidic

24. Find the odd one.
(A) Adenine (B) Cytosine
(C) Thymine (D) Uracil

25. ATP, the energy currency of cell is a
(A) Protein (B) Nucleotide
(C) Nucleoside (D) Coenzyme

*26. The two strands of DNA are
(A) similar in nature and complementary
(B) anti-parallel and complementary
(C) parallel and complementary
(D) basically different in nature

*27. RNA is genetic material in
(A) bacteria
(B) cyanobacteria
(C) bacteriophages
(D) plant viruses

28. Which RNA is present in more amount in the cell?
(A) m-RNA (B) t-RNA
(C) r-RNA (D) not certain

29. Smallest RNA is
(A) t-RNA (B) m-RNA
(C) r-RNA (D) not specific

30. Hair pin like structure is observed in
(A) m-RNA (B) t-RNA
(C) r-RNA (D) DNA

31. _____catalyze hydrolysis of ester, ether etc.
(A) Lyases (B) Ligases
(C) Hydrolases (D) Transferases

32. _____ catalyze interconversions of geometric, optical and positional isomers.
(A) Transferases
(B) Ligases
(C) Oxidoreductase
(D) Isomerases

33. _____ are also known as dehydrogenases.
(A) Oxidoreductases
(B) Ligases
(C) Lyases
(D) Transferases

34. The enzyme functions best at temperature
(A) 30° to 50° C
(B) 15° to 25° C
(C) 20° to 30° C
(D) 40° to 50° C

35. As temperature changes from 30° to 45° C, the rate of enzyme activity will
(A) decrease
(B) increase
(C) first increase and then decrease
(D) first decrease and then increase

36. Out of the following, which is not a property of enzymes?
(A) Specific in nature
(B) Proteinaceous
(C) Used up in reaction
(D) Increased rate of biochemical reaction

*37. Majority of cellular enzymes function best at _____ pH.
(A) acidic
(B) basic
(C) neutral
(D) strong base

38. The _____ action of enzyme with a substrate is explained by lock and key theory.
(A) relative
(B) specific
(C) random
(D) abstract

39. _____ was the first to isolate urease in pure crystalline form from the Jack bean extract.
(A) W. Kuhne
(B) G. Mendel
(C) J. B. Sumner
(D) both (A) and (C)

40. The full form of NADP is
(A) Nicotinamine Alanine Dinucleoline Phosphate.
(B) Nicotinamide Adenine Dinucleotide phosphate.
(C) Nicotinamine Arginine Di-phosphate.
(D) Nucleotide Asparagine Dinucleotide phosphate.

Answers to Multiple Choice Questions

1.	(B)	2.	(D)	3.	(D)	4.	(A)
5.	(C)	6.	(A)	7.	(D)	8.	(B)
9.	(C)	10.	(A)	11.	(B)	12.	(C)
13.	(D)	14.	(A)	15.	(B)	16.	(B)
17.	(B)	18.	(B)	19.	(D)	20.	(C)
21.	(A)	22.	(D)	23.	(C)	24.	(A)
25.	(B)	26.	(B)	27.	(D)	28.	(C)
29.	(A)	30.	(B)	31.	(C)	32.	(D)
33.	(A)	34.	(A)	35.	(C)	36.	(C)
37.	(B)	38.	(B)	39.	(C)	40.	(B)

TOPIC TEST

Total : 25 Marks

Section A (1 × 5 = 5 Marks)

1. _____ is the disaccharide.
   (A) Lactose (B) Casein
   (C) Insulin (D) Glucagon

2. _____ is the smallest RNA.
   (A) t-RNA (B) m-RNA
   (C) r-RNA (D) Both (B) and (C)

3. What is the function of t-RNA?

4. Which type of bond/linkage is present between the amino acids in a long chain?

5. What are transport proteins? Give example.

Section B (2 × 3 = 6 Marks)

6. Explain with examples derived lipids.

   OR

   Write a short note on enzyme inhibitors.

7. What are homopolysaccharides and heteropolysaccharides? Give examples.

8. Explain the effect of temperature on the enzyme activity.

Section C (3 × 3 = 9 Marks)

9. Describe the following properties of enzymes.
   a. Colloidal nature b. Specificity c. Amphoteric nature

10. Describe types of non-genetic RNA.

    OR

    How is protein molecule formed? Give one example of each transport protein, contractile protein and defensive protein.

11. Explain the mechanism of enzyme action.

Section D (5 × 1 = 5 Marks)

12. a. What are carbohydrates? Explain difference between monosaccharides and disaccharides?

    b. Write a note on biological function of lipids.

    OR

    a. Differentiate between DNA and RNA.

    b. Write a note on m-RNA.

    c. What are conjugated proteins?