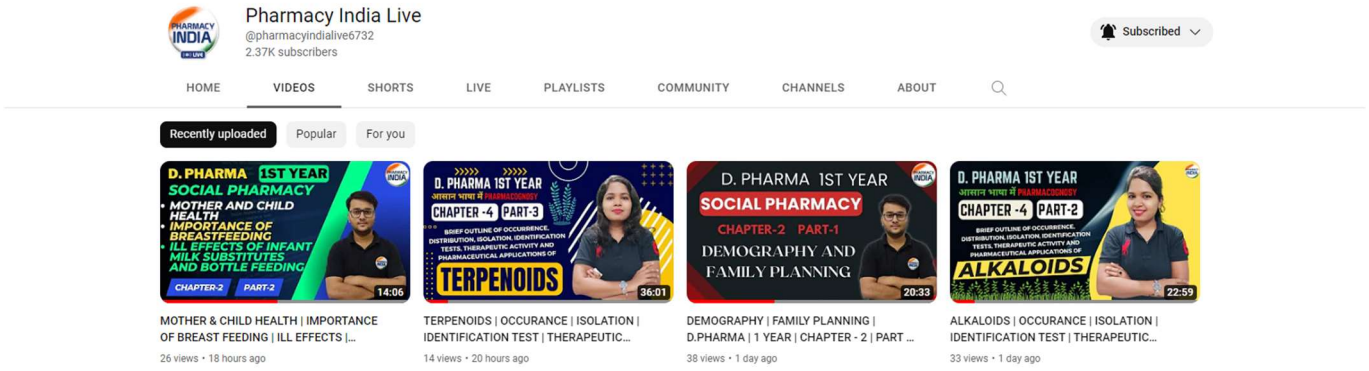
BIOCHEMISTRY AND CLINICAL PATHOLOGY

MODEL PAPER – 2

Syllabus to be covered in this module are-

- ❖Chapter-5 Nucleic Acids
- ❖Chapter-6 Enzymes
- ❖Chapter-7 Vitamins
- ❖Chapter-8 Metabolism



Subscribe करें

जुड़िए हमारे साथ

WhatsApp

9389516306

Pharmacy India Live

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

Questions

Long Questions-

Ques.1 Explain in detailed about biological roles of nucleic acids (RNA & DNA).

Ques.2 Discuss in detailed about enzyme kinetics.

Ques.3 Mention the enzymes as therapeutic agents.

Ques.4 Write in detailed about diseases related to abnormal metabolism of carbohydrates.

Ques.5 Discuss respiratory chain or electron transport chain (ETC).

Short Questions

Ques.1 Write a short note on genetic code.

Ques.2 Give the structure of DNA.

Ques.3 Give the structure of RNA.

Ques.4 Differentiate between nucleosides and nucleotides.

Ques.5 Write a short note on nucleic acid.

Ques.6 Enlist the characteristics of enzyme.

Ques.7 What are the physiological effects of vitamin A.

Ques.8 Give the sources for the following vitamins

a) Vit-D
b) Vit-E
c) Vit-B
d) Vit-C

Ques.9 Give the classification of vitamins.

Ques.10 Write a short note on the following vitamins-

a) Vit-A
b) Vit-B
c) Vit-C

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

d) Vit-D
e) Vit-E

Ques.11 Give the biological importance (functions) of glycolysis.

Ques.12 Give the regulation of blood glucose level.

Ques.13 Write a short note on carbohydrates.

Ques.14 What is oxidative phosphorylation.

PHARMACY INDIA

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

Long Answers

Ques.1 Explain in detailed about biological roles of nucleic acids (RNA & DNA).

Ans- BIOLOGICAL ROLES OF NUCLEIC ACIDS (DNA AND RNA)

DNA has a key role in all biosynthetic and hereditary functions of the living organisms. Its few important functions are:

1. Replication

- DNA can reproduce itself by the phenomenon of **replication.**
- The double-helix molecule of DNA embodies a built in template system for self-replication. Because of the specificity of base pairing, one chain automatically decides the base pairing of the other chain. Thus cach chain can act as template for the synthesis of other
- The **replication** starts with the disruption of H-bonds followed by separation of two polynucleotide strands.

Each **purine** and **pyrimidine** base of each polynucleotide strand attracts a complementary free nucleotide available for polymerization in cell and holds it in place by means of H-bond. Once held in place, the nucleotides are joined together by formation of phosphodiester bond, resulting in the formation of a new polynucleotide molecule of predetermined base sequence. Thus two double helix identical with each other are formed.

2. Genes are composed of the DNA-proteins. These are believed to be associated with the mechanism of retention of memory in the brain. Some of the viruses which infect the bacterial cells are purely DNA proteins.

3. DNA has another function to determine the kind of protein which a cell has to manufacture. The process of protein synthesis is initiated, guided, regulated and controlled by DNA molecule. The DNA mediated synthesis of proteins takes place by the following steps:

(A) Transcription

- The process which leads to the synthesis of three types of RNAS is called transcriptio
- Each of these three types of RNA does different functions.
- Initially the double-helix of DNA partially unwinds and one of the two strands act as a template for the synthesis of RNA chain in a manner similar to replication of DNA according to **the base-pairing principle.**

For example: Uracil (U) in incipient RNA appears opposite adenine (A) of DNA;
Cytosine (C) appears opposite guanine (G);

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

Adenine (A) appears opposite thymine (T) and Guanine (G) appears opposite cytosine (C) of DNA. When the RNA strand is synthesized, the DNA-RNA helix separates. The RNA, thus synthesized, migrates to the cytoplasm while the DNA itself returns to its normal double helix structure

In this way 3 types of RNAs are synthesized.
(i) Messenger RNA or m-RNA
(ii) Transfer RNA or 1-RNA
(iii) Ribosome RNA or r-RNA

(B) Translation

- The synthesis of the protein mainly takes place in the cytoplasm of the cell.
- It begins with the attachment of m-RNA to the very small ribosome particles present in the cytoplasm.
- The m-RNA then gives the message of the DNA for a specific protein synthesis to the template in the ribosome.
- The specific ribonucleotide sequence in m-RNA determines the order in which the different amino acid residues have to be joined.
- The four bases in m-RNA, ie, A, C, G and U serve in the form of triplets.
- Each triplet serve as a code for a particular amino acid. Since there are four bases, 43=64 triplets are possible.
- Out of 64 triplets, 61 form the code for specific amino acids while remaining 3 triplets constitute the code for **termination of chain**. The chain termination step codes are also called stop codons or
- **Nonsense codons**.
- As there are only 20 amino acids, therefore, more than one triplet combinations cede for the same amino acid.

For example: Phenyl alanine can be represented by two triplets viz., UUU, and UUC. A difference of a single base in the DNA molecule or a single error in the reading of the code can cause a change in the amino acid sequence which leads to **Mutation.**

Ques.2 Discuss in detailed about enzyme kinetics.

Ans- ENZYME KINETICS

Enzyme kinetics can be defined as "the study of reaction rate and how it changes in response to change in experimental parameters". In the year 1903, Victor Henery had proposed that enzyme combines with the substrate value to form ES complex as a necessary step in enzyme catalysis. Later in the year 1913, Leonor Michaelis and Maud Menten had expanded the above theory in the form of Machaelis-Menten equation.

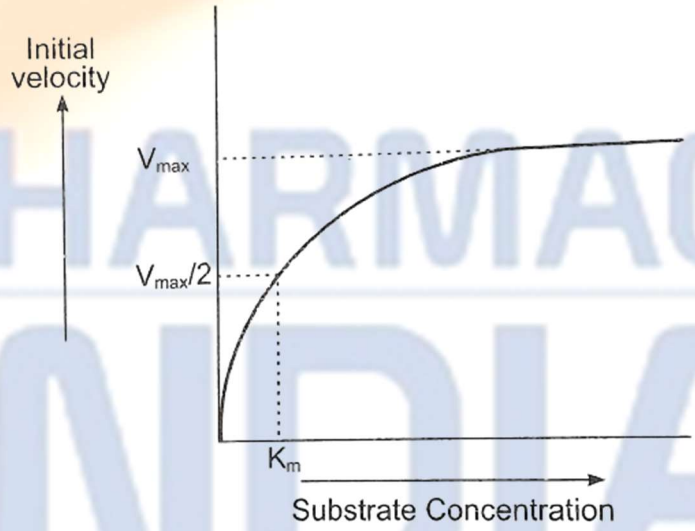
DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

According to this equation, enzyme (E) first combines with the substrate (S) to form an enzyme substrate (ES) complex and then breaks to yield enzyme (E) and Product (P).

$$E + S \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} ES$$

$$ES \underset{K_{-2}}{\overset{K_2}{\rightleftharpoons}} E + P$$

From an enzyme catalysed reaction, enzyme present in the reaction mixture in two forms; free as E and in combined form as ES. At low concentration of S enzyme remains in uncombine form, thus rate of reaction is proportional to concentration of S in order to push equation (1) in forward direction. The maximum initial rate (V) can be observed when the entire enzyme is in ES complex form, this will happen when S is present in high concentration and all free enzyme is converted to ES form. After this ES form is transformed to produce the product (P).



From the above equation one can determine the rate of reaction as,

$$V_o = \frac{V_{max}(S)}{K_m(S)}$$

Where,

V_o = Initial velocity at S concentration

K_m =Michaelis Menten Constant

V_{max} =Maximum velocity

$$E + S \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} ES \underset{K_{-2}}{\overset{K_2}{\rightleftharpoons}} E + P$$

Since, the rate of any reaction is dependent on rate of formation(K_1)and breakdown (K_1 +K_2)OF ES complex.

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

Rate of formation of ES complex $=K_1([E_t]-[ES])[S]$

Rate of breakdown of ES complex $= K_{-1[ES]} + K_2 [ES]$

But at equilibrium state when rate of formation and rate of breakdown of ES complex is equal,

$$K_1 \cdot (\{[Et]-[ES]\}) \cdot [S] = K_{-1} \cdot [ES] + K_2 \cdot [ES]$$

$$K_1[Et] \cdot [S] - K_1[ES] \cdot [S] = K_{-1}[ES] + K_2 \cdot [ES]$$

$$K_1[Et] \cdot [S] = K_{-1}[ES] + K_2 \cdot [ES] + K_1[ES] \cdot [S]$$

$$K_1[Et] \cdot [S] = [K_{-1} + K_2 + K_1[S]] \cdot [ES]$$

$$[ES] = \frac{K_1[Et] \cdot [S]}{K_{-1} + K_2 + K_1[S]}$$

$$[ES] = \frac{[Et] \cdot [S]}{\frac{K_{-1} + K_2 + K_1[S]}{K_1}}$$

Then,

$$[ES] = \frac{[Et] \cdot [S]}{[S] + \frac{K_{-1} + K_2}{K_1}}$$

$$[ES] = \frac{[Et] \cdot [S]}{[S] + K_m}$$

Where,K_m Machaelis-Menten constant.

But initial velocity of a reaction V_o can be determined by rate of breakdown of ES to form the product, thus

$$V_o=K_2(ES)$$

Now, we can define the initial velocity V_O, in terms of [ES]as,

Ques.3 Mention the enzymes as therapeutic agents.

Ans- **ENZYMES AS THERAPEUTIC AGENTS**

1. Trypsin: It is used in the treatment of thrombo-Phlebitis.

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

It is also used in the treatment of some types of Ulcers

Streptokinase: It is obtained from the culture of bacteria streptococcushaemolyticus. It is a bacterial enzyme

- It is used in the treatment of Myocardial infarction.
- It is a useful enzyme in the treatment of fibrinolysis and dissolution of clot

3. Pepsin

- It is obtained from the gastric mucosa of cattle.
- It is a proteolytic enzyme.
- It is used in the treatment of gastric achylia.

4. Urokinase

- It is manufactured from human urine.
- It is used in the treatment of myocardinal Infarction and dissolution of blood clot in the body.

5. Thromboplastin: It is used in formation of blood coagulation.

6. Lipase : It is used in pancreatic deficiency state.

7. Asparginase: It is used in the treatment of cancer.

8. Proteases & Amylase: It is used in dyspesia

9. Pancreatin

- It is obtained from the mammalian pancreas.
- It has proteolytic, amylolytic and lipolytic properties. It is work as digestive enzyme.
- It is used in stomach ache etc.

10. a-Amylase

- It is obtained from the fungi Aspergillus oryzae and bacteria bacillus subtilis.
- It is a digestive enzyme. It converts starch into dextrin and maltose.

11. Haluronidase

- This enzyme is present in the testes and serum of mammalian animals.
- It depolymerise mucopolysaccharides.

12. Papain

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

- It is obtained from papaya fruit.
- These are proteolytic enzyme.

13.Chymotrypsin

- It is present in the mammalian's pancreas. It is proteolytic enzyme.
- It is used in the treatment of cataract and in surgical operations.

14. Alteplase

- It is obtained by recombinant DNA technology.
- It is a tissue plasminogen activator.
- It is used in the treatment of myocardial infarction

15. Penicillinase Enzyme: It is also called as p-lactamase enzyme.

- It is a culture filtrate of bacillus subtilis and bacillus cereus bacteria
- It hydrolyses B-lactam antibiotics.
- It is used in the detection and test of penicillin Inhibitor.

Ques.4 Write in detailed about diseases related to abnormal metabolism of carbohydrates.

Ans- Diseases Related to Abnormal Metabolism of Carbohydrates.

Carbohydrates are sugars. Some sugars are simple, and others are more complex. Sucrose (table sugar) is made of two simpler sugars called glucose and fructose. Lactose (milk sugar) is made of glucose and galactose. Both sucrose and lactose must be broken down into their component sugars by enzymes before the body can absorb and use them. The carbohydrates in bread, pasta, rice, and other carbohydrate-containing foods are long chains of simple sugar molecules. These longer molecules must also be broken down by the body. If an enzyme that is needed to process a certain sugar is missing, that sugar can accumulate in the body, causing problems.

Disorders of carbohydrate metabolism include:

- Galactosemia
- Hereditary fructose intolerance
- Glycogen storage diseases
- Glucose 6 phosphate dehydrogenase deficiency

1. Galactosemia

- **Galactosemia** (a high blood level of galactose) is a carbohydrae metabolism disorder that caused by a lack of one of the enzymes necessary for metabolizing galactose, a sugar that part of a larger sugar called lactose (milk sugar).
- A metabolite that is toxic to the liver and kidneys builds up

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

- The metabolite also damages the lens of the eye, causing cataracts.
- Galactosemia occurs when parents pass a defective gene that causes this disorder on to thes children
- Galactosemia is caused by a lack of one of the enzymes needed to metabolize the sugar in milk.
- Symptoms include vomiting, jaundice, diarrhea, and abnormal growth.
- The diagnosis is based on blood and urine tests. Even with adequate treatment, affected children still develop mental and physical problems.
- Treatment involves completely eliminating milk and milk products from the diet Galactose is a sugar that is present in milk as part of lactose and in some fruits and vegetables
- Deficiency of a certain enzyme can alter the breaking down (metabolizing) of galactose, which can lead to high levels of galactose in the blood (galactosemia). There are different forms of galactosemia, but the most common and the most severe form is referred to as **classic galactosemia.**
- **Newborns** with galactosemia seem normal at first but, within a few days or weeks of consuming breast milk or lactose-containing formula, lose their appetite, vomit, become jaundiced, have diarrhoea, and stop growing normally. White blood cell function is affected, and serious infections can develop
- If treatment is delayed, affected children remain short and become intellectually disabled or may die.

(a) Diagnosis

- Blood and urine tests
- Galactosemia is detectable with a blood test. Another test is done to look for elevated levels of galactose in the urine.

(b) Prognosis

- If galactosemia is recognized at birth and adequately treated, liver and kidney problems do not develop, and initial mental development is normal.
- However, even with adequate treatment, children with galactosemia may have a lower intelligence quotient (10) than their siblings, and they often develop speech and balance problems during adolescenc
- Many children also have cataracts. Girls often have ovaries that do not function, and only few are able to conceive naturally.
- Boys, however, have normal testicular function.

(c) Treatment

Galactosemia is treated by completely eliminating milk and milk products-the main source of galactose-from an affected child's diet. Because galactose is present in both human breast milk and cow's milk-based formulas, infants are typically fed a soy-based infant formula after diagnosis.

2. Glycogen Storage Disease(GSD)

- Glycogen is the storage form of glucose (sugar) in the body

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

- It is a complex material made of individual glucose molecules linked together in long chains with many branches of the chains (just like a tree) Glycogen is mainly stored in the liver and muscle cells, but the kidneys and intestines also store some limited amounts of glycogen.
- **Glycogen Storage Diseases** are considered inherited metabolic disorders A metabolic disorder is a disease that disrupts metabolism. Therefore, a person who has a metabolic disorder has a difficult time breaking down certain foods and creating energy.
- **Glycogen Storage Diseases (GSDs):** These are a group of inherited disorders associated with glycogen metabolism, familial in incidence and characterized by deposition of normal or abnormal type and quantity of glycogen in the tissues
- A person with a glycogen storage disease (GSD) has an absence or deficiency of one of the enzymes responsible for making or breaking down glycogen in the body. This is called an enzyme deficiency. The enzyme deficiency causes either abnormal tissue concentrations of glycogen (too much or too little) or incorrectly or abnormally formed glycogen (shaped wrong)

General symptoms of GSD may include:

1. Not growing fast enough.

(ii) Not feeling comfortable in hot weather (heat intolerance)

(iii) Bruising too easily.

(iv) Low blood sugar (hypoglycemia).

(v) An enlarged liver. (vi) A swollen belly.

(vii) Weak muscles (low muscle tone)

(viii) Muscle pain and cramping during exercise

List of Different GSDs (Glycogen Storage Diseases)

Type	Enzyme Defect	Clinical Features
Type 1(Von Gierke' s Disease)	Glucose-6 phosphatase deficiency**.**	Hypoglycemia,enlarged liver and kidneys, gastro intestinal symptoms,Nose bleed,short stature,gout
Type II (Pompe's disease)	Acid maltase deficiency	Dimimshed muscle tone heart failure, enlarged, tongue
Type III (Cori's disease, Forebe disease)	Debranching enzyme deficiency	Hypoglycemia, enlarged liver, cirrhosis, muscle weakness, cardiac involvement
Type IV (Andersen's diminished disease)	Branching enzyme deficiency	Enlarged liver & spleen, cirrhosis, muscle tone, possible nervous system involvement

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

Type V (Meardle's diseae)	Muscle phosphorylase deficiency	Muscle weakness, fatigue, and muscle cramps

Ques.5 Discuss respiratory chain or electron transport chain (ETC).

Ans- Respiratory Chain or Electron Transport Chain (ETC)

An electron transport chain (ETC) is a series of complexes that transfer electrons from electron donors to electron acceptors via **redox** (both reduction and oxidation occurring simultaneously) reactions, and couples this electron transfer with the transfer of protons (H' ions) across a membrane. This creates an electrochemical **proton gradient** that drives the synthesis of adenosine triphosphate (ATP), a molecule.

Eukaryotic cells have mitochondria, which produce ATP from products of the citric acid cycle, fatty acid oxidation, and amino acid oxidation. At the mitochondrial inner membrane, electrons from NADH and FADH, pass through the electron transport chain to oxygen, which is reduced to water The electron transport chain comprises an enzymatic series of electron donors and acceptors Four membrane-bound complexes have been identified in mitochondria during electron transport chain

1. Complex I

In Complex (NADH ubiquinone oxidoreductase, NADH-CoQ reductase, or NADH dehydrogenase, two electrons are removed from NADH and ultimately transferred to a lipid-soluble carrier, ubiquinone (UQ).

NADH is oxidized to NAD. by reducing Flavin mononucleotide to FMNH, in one two-electron step. FMNH, is then oxidized in two one-electron steps, through a semiquinont intermediate. Each electron thus transfers from the FMNH, to an Fe-S cluster, from the Fe-S cluster to ubiquinone (Q)

Mechanism: Complex-1 catalyses the transfer of a hydride ion from NADH to FMN, from which two electrons pass through a series of Fe-S centers to the "iron-sulfur protein N-2 in the matrix arm of the complex.

$$NADH \rightarrow FMN \rightarrow (Fe\text{-}S_1)\ (Fe\text{-}S_2) \rightarrow (Fe\text{-}S_1) \rightarrow (Fe\text{-}S_1) \rightarrow CoQ$$

2. Complex II

In Complex II (succinate dehydrogenase or succinate-CoQ reductase). The additional electrons are delivered into the quinone pool (Q) originating from succinate and transferred (via flavin adenine dinucleotide (FAD)) to Q. (CoQ or ubiquinone)

Mechanism: One protein has a covalently bound FAD and an Fe-S center with four Fe atoms, a second iron-sulfur protein is also present. Electrons pass from succinate to FAD, then through the Fe-S centers to ubiquinone.

Complex-II catalyzes the reduction of Co.Q by electrons remove from succinate,

$$Succinate + Co \rightarrow Fumarate + CoQ.H_2$$

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

3.Complex III

In Complex III (cytochrome be, complex or $CoQH_2$-cytochrome c reductase) the Q-cycle contributes to the proton gradient by an absorption/release of protons.

Mechanism: The Complex-111 couples the transfer of electrons from ubiquinone (QH_2) to cytochrome. This is a multi-protein complex, consisting of a cluster of iron-sulfur proteins, "Cyt.b" and "Cyt.C_1". Cytb & C_1, contain heme prosthetic group. During this process of transfer of electron, the iron in heme group shuttles between Fe^{+3} and Fe^{+2} forms. The free energy change is -10 kcal/mol; one molecule of ATP is synthesized in this step.

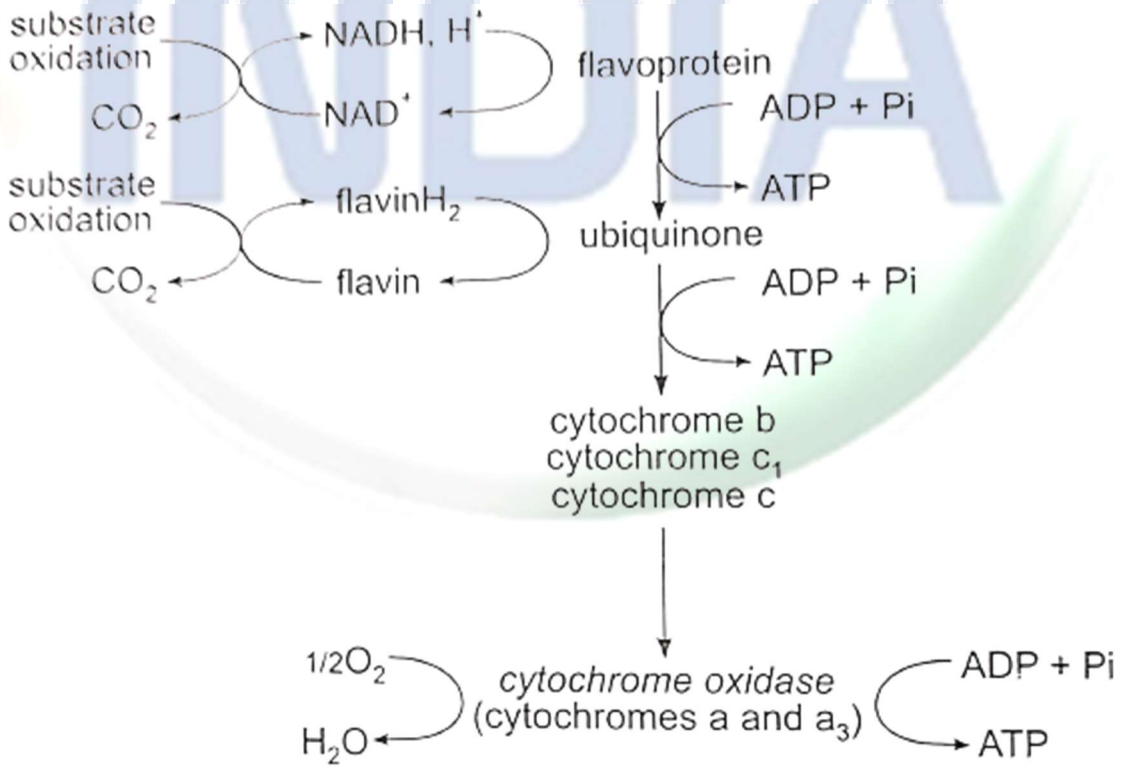
4. Cytochrome C

It contains one heme prosthetic group. The term cytochrome is derived from a Greek word meaning "Cellular colors". It is not a part of an enzyme complex, it moves between complex.III and IV as a freely soluble protein.

5. Complex IV

Cytochrome a and a3 and bound copper constitute this complex. It is pertinent to mention that electrons follow either the pathway of complexes 1, III and IV or II or III and IV. Mechanism: In the final step of the respiratory chain, complex IV carries electrons from cytochrome.C to molecular oxygen. reducing it to H_2O. Four electrons are accepted from Cytochrome.C, and passed on to molecular oxygen. Complex, IV also functions as a proton pump; free energy change is-24 kcal/mol and 1ATP molecule is synthesized. Cyt.oxidase contains two heme groups and two copper fons. The two heme groups are structurally similar, but they are located at different parts of the enzyme complex and denoted as

"Cyt.a" and "$Cyta_3$," The functional unit of the enzyme is a single protein and is referred to as Cytochrome-a,a_3



Short Answers

Ques.1 Write a short note on genetic code.

Ans- GENETIC CODE

The genetic code can be defined as "the set of certain rules using which the living cells translate the information encoded within genetic material (DNA or mRNA sequences)."
The ribosomes are responsible to accomplish the process of translation. They link the amino acids, in a m-RNA specified order using r-RNA (transfer RNA) molecules to carry amino acids and to read the m-RNA three nucleotides at a time.

Genetic Code Table

The complete set of relationships among amino acids and codons (A codon is a sequence of 3 nucleotides which together form a unit of genetic code in a DNA or RNA molecule) is said to be a genetic code.

- Genetic code can be summarised in a table as follows:
- In the table many amino acids are shown by more than one codon. (e.g., leucine in m-RNA language has 6 ways.
- Genetic code is universal in nature. This indicates that virtually all species with some exceptions use the genetic code for protein synthesis.

Properties of Genetic Code

(i) Triplet code
(ii) Degenerate code
(iii) Non-ambiguous and universal
(iv) Non-overlapping code
(v) Start and stop codons
(vi) Commaless
(vii) Polarity.

Ques.2 Give the structure of DNA.

Ans- STRUCTURE OF DNA (WATSON-CRICK MODEL)

J. Watson and F. Crick (1953) made a molecular model for DNA with the help of X-ray diffraction photograph (taken by Rosalind franklin). They conduded that: (i) The DNA polynucleotide chain has the form of a regular helix. (ii) The helix has a diameter of about 20 A and
(iii) The helix makes one complete turn every 34 A° along its length.
Considering the known density of DNA molecule, **Watson and Crick** proposed that:

- The helix must contain two polynucleotide chains or two strands of 10 nucleotides (the internucleotide distance is 3.4 A) each per turn.
- The two strands of DNA molecule are complementary to each other, i.e., at every level one stack (strand) carries a purine base and the other a pyrimidine base.
- Their base sequence is interdependent which follows the **base-pairing rule**.
- Thymine (T) always has adenine (A) opposite to it, and guanine (G) is always opposite to cytosine (C).
- The two strands are held together through H-bonds which are formed between electron donar atoms e.g., O, N.

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

- Formation of 2 H-bonds between Adenine (A) and Thymine (T), and 3H-bonds between guanine (G) and cytosine (C) is maximally possible.
- The molar content of Adenine (A) equals the molar content of thymine (T) and the molar content of guanine (G) equals that of cytosine (C) in DNA.
- The ratio of Thymine (T) + Adenine (A) to guanine (G) + cytosine (C) is not equal and varies from DNA to DNA obtained from different sources.
- Though the base pairs in the molecule can be arranged in any order, the order is one strand is complementary to that in the other. This relationship between die strands is responsible for one of the most important properties of DNA.

Ques.3 Give the structure of RNA.

Ans- **STRUCTURE OF RNA**

- The molecules of RNA (ribonucleic acids) are less highly organized.
- These are single stranded molecules having varying molecular shapes.
- They contain 60 to 6000 mono nucleotides in their molecules. The different mononucleotides of RNA molecules are Adenylic acid (A), Guanylic acid (G),
- Uridylic acid (U), and Cytidylic acid (C). The different mononucleotides in a RNA molecule are inter-linked by the3-5'-phosphodiester bonds.
- RNA are of the three types. All these three types are made from DNA.

mRNA (Messenger-ribonucleic acid): The size of mRNA depends upon the size of the protein it is directed to make.

Function: mRNA molecules carry the genetic information from DNA to the ribosomes.

rRNA (Ribosomal-ribonucleic acid): RNA is the largest in size and amount of the three types of RNA. About 60 to 80% of the total RNA in cells is rRNA

Function: RNA combines with proteins to form ribosomes which are intracellular sub structures where proteins are synthesized.

tRNA (Transfer-ribonucleic acid): RNA is the smallest of the three kinds of RNA. Each IRNA molecule consists of about 100 nucleotides in a single chain.

Function: RNA carries the amino acids to the ribosomes to be incorporated into the protein.

Ques.4 Differentiate between nucleosides and nucleotides.

Ans- **NUCLEOSIDES**

These are formed by the combination of bases (Purine or Pyrimidine) with pentose sugar (ribose or 2-Deoxyribose) in the furanose form.

For example: A nucleoside made of sugar (ribose) and base (adenine) is called adenosine.

The common names of ribonucleosides are derived from the name of nitrogenous bases as:

- Adenosine
- Cytidine
- Guanosine and
- Uridin
- For Deoxyribonucleosides, the prefix deoxy is used if the base is combined with deoxyribose as:

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

- Deoxy adenosine
- Deoxyguanosine
- Deoxycytidine, and
- Deoxythymidine

NUCLEOTIDES

The Nucleotides are formed by the combination of sugar, base and phosphoric acid.

For example: A Nucleotides made of ribose + adenine + Phosphoric add is called Adenylic acid.

- Nucleotides are the fundamental units of Nucleic acids.
- These are referred to as nucleoside monophosphates.

Function of Nucleotides

1. They are precursors of DNA and RNA.
2. They work as energy carriers in cells.
3. They are component of enzyme co-factor.
4. They also work as chemical messengers.

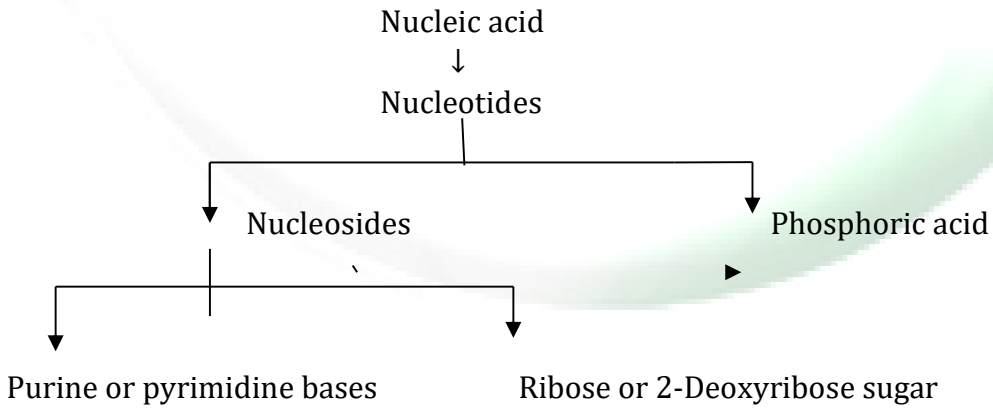
Ques.5 Write a short note on nucleic acid.

Ans- Nucleic acids

- Nucleic acid (RNA, Ribonucleic acid and DNA, Deoxyribonucleic acid) is biological are found in high polymers
- These are the major constituent of the nucleus of a cell where they concentration.
- Nucleic acids are the substances which control heredity.
- They play a crucial role in protein biosynthesis.

CONSTITUENTS OF NUCLEIC ACIDS

- The structure of Nucleic acids is quite complex Their composition can be well understand by their hydrolysis products:



These are made up of:

- **Sugars** (ribose in ribonucleic acid and deoxyribose in deoxyribonucleic acid).
- **(ii) Four bases** (three bases adenine, guanine and cytosine are common in both the nucleic acids whereas uracil is present in RNA and thymine is present in DNA) and
  (iii) Phosphoric acid.

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

The various class of compounds from these 3 components combinations are:

Sugar+ base ⟶ Nucleosides

Sugar+ base+ phosphoric acid ⟶ Nucleotide

(Sugar+ base + Phosphoric add), ⟶ Nucleic add

Ques.6 Enlist the characteristics of enzyme.

Ans- CHARACTERISTICS OF ENZYME

1. Enzymes are proteineous except of small group of catalytic RNA modifying catalysts known as Ribozymes, which are molecules of ribonucleic acid that catalyse reactions on the phosphodiester bond of other RNAs. Being protein enzymes contain both amino as well as the carboxyl group.

2. Since the enzymes are proteineous they are usually of high molecular weight (>12000).

3. Enzymes activity depends upon the integrity of their native protein conformation.

4. As soon as they dissociate or denatured, they lose their catalytic activity and when finally broken into the individual amino acids, their catalytic activity destroyed.

5. Some enzymes are modified by phosphorylation, glycosylation, and other process and many of such alteration leads to the regulation of such enzyme action.

6. Some enzymes require an additional chemical component called as cofactor. These may be one or more additional inorganic ions like Fe, Mg, Zn or a complex organic or metal organic molecule called as Coenzymes, while some requires both coenzyme as well as cofactor for their activity. These coenzymes and cofactors that are covalently bound to the protein molecule of the enzyme is called as **Prosthetic group**, and a complete enzyme together with coenzyme and/or cofactor is called as **Holoenzyme**, the protein part of such enzymes is called as **Apoenzymes or Apoproteins.**

7. Enzymes also play a central role in health and disease. Also found that they profoundly used in the diagnosis of several diseases, cell injuries, liver cirrhosis, etc.

Ques.7 What are the physiological effects of vitamin A.

Ans- Physiological Effects of Vitamin A

Vitamin A and its metabolites retinal and retinoic acid appear to serve a number of critical roles in physiology, as evidenced by the myriad of disorders that accompany deficiency or excess states. In many cases, precise mechanisms are poorly understood,

Some of the well-characterized effects of vitamin A include:

- **Vision:** Retinal is a necessary structural component of **rhodopsin** or visual purple, the light sensitive pigment within rod and cone cells of the retina. If inadequate quantities of vitamin A are present, vision is impaired**.**
- **Resistance to infectious disease**: In almost every infectious disease studied, vitamin A deficiency has been shown to increase the frequency and severity of disease. Several large trials with malnourished children have demonstrated dramatic reductions in mortality from diseases such as measles by the simple and inexpensive procedure of providing vitamin A supplementation. This "anti-infective effect is undoubtedly complex, but is due, in part, to the necessity for vitamin A in normal immune responses. Additionally, many infections are associated with inflammatory

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

reactions that lead to reduced synthesis of retinol-binding protein and thus, reduced circulating levels of **retinol.**

- **Epithelial cell "integrity":** Many epithelial cells appear to require vitamin A for proper differentiation and maintenance. Lack of vitamin A leads to dysfunction of many epithelia -the skin becomes keratinized and scaly, and mucus secretion is suppressed. It seems likely that many of these effects are due to impaired transcriptional regulation due to deficits in retinoic acid signalling.
- **Bone remodelling:** Normal functioning of osteoblasts and osteoclasts is dependent upon vitamin A
- **Reproduction:** Normal levels of vitamin A are required for sperm production, reflecting a requirement for vitamin A by spermatogenic epithelial (Sertoli) cells. Similarly, normal reproductive cycles in females require adequate availability of vitamin A.

Ques.8 Give the sources for the following vitamins

a) Vit-D
b) Vit-E
c) Vit-B
d) Vit-C

Ans-

a) Vit-D-
Sources

Skin Exposure to Sun: Ultraviolet (UV-B) rays from the sun convert dehydrocholesterol in the skin into vitamin D_{J} (cholecalciferol). Exposure of the face, arms, legs or back (without sunscreen) to sun for 5-30 minutes between 10 AM and 3 PM twice a week (less than 42° latitude from March to October, and less than 34° year through) results in the production of sufficient amount of vitamin D in the body in healthy people.

Daily Intake

According to the Institute of Medicine of the National Academics in the US, the **Recommended Dietary Allowance** (RDA) for vitamin D for adults between 19-50 years is 15 mcg or 600 IU (International Units)/day, for 71+ years 20 mcg (800 1U)/day and for pregnant and breastfeeding women 15 mcg (600 IU)/day.

Intake for Infants

Human breast milk contains about 0.5-1 mcg (25-40 IU) of vitamin D per litre.

Other Source

Vitamin D can be mainly found in oily fish and liver and in smaller amounts in meat and dairy products.

b) Vit-E

Source

Adults and children 14 years and older need 15 milligrams (mg) of vitamin E per day. Children under this age need a smaller dose daily:

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

- Ages 1 to 3:6 mg/day
- Ages 4 to 8: 7 mg/day
- Ages 9 to 13: 11 mg/day
- Women who are breastfeeding should get 19 mg per day.
- Nuts and seeds, such as almonds, sunflower seeds, peanuts, and peanut butter
- Whole grains
- Vegetable-based oils, especially olive and sunflower
- Leafy vegetables
- Eggs
- Fortified cereals Kiwi
- Mango

Daily requirement: 25-30 mg for adult.

c) Vit-B

VITAMIN B, (THIAMINE)

- **Sources:** whole grain cereals (eg, whole wheat, brown rice), yeast, pork, legumes, Daily recommended intake for adults: 1-1.4 mg

VITAMIN B2 (RIBOFLAVIN)

- Sources: meat, fish, eggs, milk, green vegetables, yeast.
  Daily requirements: Adult-1.5-1.8 mg
  Children 0.8-1.2 mg

VITAMIN B3 (NIACIN)

- **Sources:** meat (liver), cereals, seeds, legumes

VITAMIN B5 (PANTOTHENIC ACID)

- **Source:** Small amounts are in almost all foods; contain a large amount of yeast, liver, meat, milk, whole grains, and legumes. The daily recommended dose for adults: 6 mg

VITAMIN B6 (PYRIDOXINE)

- **Source:** It is abundant in food. Daily requirements: The daily recommended dose for adults: 13-17 mg.

VITAMIN B_7 (BIOTIN)

- **Source:** At low concentrations in many foods. Rich sources are yeast, liver, egg yolk, nuts, influentials.
- **Daily requirements:** 30-60 mg

VITAMIN B, (FOLIC ACID)

- **Source**: Liver, yeast, green leafy vegetables, as well as whole grain cereals, meat, milk, eggs, and legumes.

VITAMIN B12 (COBALAMIN)

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

- **Source:** In nutritionally significant quantities occurs only in animal foods. Rich sources are liver, kidney, meat warm-blooded animals (1-2 µg/100 g), fish, egg yolk and dairy products (milk Hg/100, 03 ml cheese µg/100 0.2 to 0.6g).

d) Vit-C

Source

Fruits and vegetables are the main sources of ascorbic acid. Citrus fruits like limes, lemons, oranges, mosambis, grapes and tomatoes.

Vitamin-C is also found in considerable amount in fresh mangoes, papayas, and other fruits. Cauliflower, green leafy vegetables, raw cabbages, green chilies also supply Vitamin-C.

Guavas and sprouted grams are valuable sources of Vitamin-C.

Ques.9 Give the classification of vitamins.

Ans- Classification of Vitamins

S. No	Water soluble	Fat soluble
1.	Vitamin B1 (Thiamine)	Vitamin A
2.	Vitamin B2 (Riboflavin)	Vitamin E
3.	Vitamin B3 (Niacin or Nicotinic Acid)	Vitamin D
4.	Vitamin B5 (Pantothenic Acid)	Vitamin K
5.	Vitamin B6 (Pyridoxine)	
6.	Vitamin B12	
7.	Folic Acid	
8.	Biotin	
9.	Lipoic Acid	
10.	Inositol	
11.	Vitamin C (Ascorbic Acid)	

Ques.10 Write a short note on the following vitamins-

a) Vit-A
b) Vit-B
c) Vit-C
d) Vit-D
e) Vit-E

Ans-

a) Vit-A

Vitamin A is a subclass of a family of lipid-soluble compounds referred to as retinoic acids

Synonym: retinol

Active forms: retinal, retinoic acid.

Chemically, vitamin A ($C_{20}H_{29}OH$) is an unsaturated alcohol called retinol. Vitamin A exists in two isomeric forms: vitamin A (retinol) is a trans-isomer and occurs naturally, whereas vitamin A2 (debydroretinal or retinal) is a cisisomer and has 30-40% of vitamin A actively.

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

Sources

Plant sources like green vegetables, fruits, and cereals supply pro vitamin A (B-carotene) in dict.

Animal sources of vitamin A are liver, milk, butter, egg yolk etc. Liver of fresh water fish contain A

Functions

(i)**Retinol** (vitamin A aldehyde) combines with lysine residues of opsin protein to form rhodopsin pigments of rod cells of retina, so it is essential for night vision.

(ii) **Retinoic acid** (vitamin A acid) has some anticancer effects.

(ii) **Vitamin A** maintains the integrity of epithelial cells; permeability of cell membranes the membranes of organelles,

(iv) In young animals' vitamin A causes growth, formation of bones and teeth.

Deficiency Symptoms

(i) Vitamin A deficiency causes the defective night vision called **night blindness** (nyctalopia Henerolopia).

(ii) In children deficiency of vitamin-A, causes **xerophthalmia** (drying of conjunctiva) and keratomalacia ulceration and softening of cornea) that may lead to complete blindness,

(iii) Toad's skin is another detectable early symptom of vitamin A where the skin becomes dry and rough particularly in the lateral part of forearms and sides of thigh.

b) Vit-B
VITAMIN B

Characteristics of Vitamin B

- A common feature of group B vitamins is their occurrence in yeast (except vitamin B12) However, if the yeast is included in the diet only as a means of rising bread, then yeast is not considered the major source of group B vitamins in humans; a small quantity of yeast does not contain nutritionally significant amount of B vitamins.
- Their metabolic effects are inter-linked.
- Deficiency of only a single vitamin occurs rarely
- They are produced by the intestinal micro flora but the amount produced is generally fraction of the daily recommended intake. only a fraction of the daily recommended intake.
- Some are more frequently called by their name, others by number. Some vitamins may not have a number because it has been found that some substances, originally considered as vitamins, are NOT essential for humans, therefore they are not vitamins or are a mixture of substances

c) Vit-C
Vitamin C, also known as ascorbic acid and L-ascorbic acid, is a vitamin found in food and used as a dietary supplement. Vitamin-C or ascorbic acid is a white crystalline, odourless compound readily soluble in water. It is a strong reducing agent and is comparatively stable in an acid medium, but is destroyed by the action of heat and catalysts such as copper.

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

Vitamin C was discovered in 1912, isolated in 1928, and in 1933 was the first vitamin to be chemically produced. It is on the World Health Organization Model List of Essential Medicines, the most effective and safe medicines needed in a health system.

Source

- ❖ Fruits and vegetables are the main sources of ascorbic acid. Citrus fruits like limes, lemons, oranges, mosambis, grapes and tomatoes.
- ❖ Vitamin-C is also found in considerable amount in fresh mangoes, papayas, and other fruits. Cauliflower, green leafy vegetables, raw cabbages, green chilies also supply Vitamin-C.
- ❖ Guavas and sprouted grams are valuable sources of Vitamin-C.

Vitamin C in the Body

Vitamin C is vital to produce Collagen. Collagen is the intercellular substance that gives bones, teeth, cartilage, blood vessels and muscles their structure. Ascorbic acid is needed for synthesis of bile acids; it also maintains skin elasticity, aids in iron absorption, and improves resistance to infection.

Daily requirement: 40-50 mg

Functions:

i. It is required for absorption of iron,
ii. It keeps gums and capillary walls healthy.
iii. It gives resistance against cold and viruses. Hence, it is often called as anti-viral vitamin,
iv. It is necessary for wound healing,
v. It acts as co-enzyme for hydroxylation and oxidation-reduction reactions. Thus, it helps in metabolism of amino acids, collagen synthesis etc.

d) Vit-D

Vitamin D is a fat-soluble vitamin, a conditionally essential nutrient, which means, it can produced in body in sufficient amounts when skin is exposed to sun light for a certain period of tim but when it is not, need to get additional amount from food or supplements.

Vitamin D is a group of fat-soluble **secosteroids** responsible for increasing intestinal absorp of calcium, magnesium, and phosphate, and multiple other biological effects. In humans, the most important compounds in this group are vitamin D, (also known cholecalciferol) and vitamin D, (ergocalciferol).

Functions

Promotes absorption of calcium and phosphate in the intestine. When blood **calcium levels are low**, vitamin D, stimulated by the parathyroid hormone (PTH), promotes the absorption of calcium and phosphate from the small intestine and bones. When blood **calcium levels are high**, vitamin D stimulates calcium incorporation into the bones and teeth and thus strengthen them. Vitamin D deficiency can result in rickets, osteomalacia or osteoporosis.

Helps to maintain the muscle strength and normal glucose levels.

Helps to maintain immunity.

Sources

Skin Exposure to Sun: Ultraviolet (UV-B) rays from the sun convert dehydrocholesterol in the skin into vitamin D_{J} (cholecalciferol). Exposure of the face, arms, legs or back (without sunscreen) to sun

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

for 5-30 minutes between 10 AM and 3 PM twice a week (less than 42° latitude from March to October, and less than 34° year through) results in the production of sufficient amount of vitamin D in the body in healthy people.

Daily Intake

According to the Institute of Medicine of the National Academics in the US, the **Recommended Dietary**

Allowance (RDA) for vitamin D for adults between 19-50 years is 15 mcg or 600 IU (International Units)/day, for 71+ years 20 mcg (800 1U)/day and for pregnant and breastfeeding women 15 mcg (600 IU)/day.

Intake for Infants

Human breast milk contains about 0.5-1 mcg (25-40 IU) of vitamin D per litre.

Other Source

Vitamin D can be mainly found in oily fish and liver and in smaller amounts in meat and dairy products.

Vitamin D Absorption

Vitamin D is absorbed in the small intestine. Absorption can occur only in the presence of fats from the food, and bile acids. Normal blood levels of vitamin D (calcidiol, 25 OHD) are 50-125 nmol/L (20-50 ng/mL).

e) Vit-E

Vitamin E: It is a fat-soluble vitamin and also known as antifertility vitamin.

Vitamin E acts as chain breaking antioxidant & is an efficient free radical scavenger. It protects low density lipoprotein (LDL) in membranes from oxidation. Is a group of eight compounds that include four tocopherols and four tocotrienols.

The most active form of vitamin E, **a-tocopherol**, is a 6-hydroxychroman derivative (chromeno) with methyl groups in position 2, 5, 7, and 8 and a phytol side chain attached at carbon 2.

Ques.11 Give the biological importance (functions) of glycolysis.

Ans- Biological importance (functions) of glycolysis:

1. Energy production:

(a) Anaerobic glycolysis gives 2 ATP.

(b) Aerobic glycolysis gives 8 ATP.

2. Oxygenation of tissues: Through formation of 2.3 bisphosphoglycerate, which decreases the affinity of Hemoglobin to O...

3. Provides important intermediates:

(a) Dihydroxyacetone phosphate: It can give glycerol-3phosphate, which is used for synthesis of triacylglycerols and phospholipids (lipogenesis).

(b) 3 Phosphoglycerate: which can be used for synthesis of amino acid serine

(c) Pyruvate which can be used in synthesis of amino acid like alanine.

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

4. Aerobic glycolysis provides the mitochondria with pyruvate, which gives acetyl CoA.

Ques.12 Give the regulation of blood glucose level.

Ans- Regulation of Blood Glucose Level

- **Blood sugar regulation** is the process by which the levels of blood sugar, primarily glucose, are maintained by the body within a narrow range.
- This tight regulation is referred to as glucose homeostasis
- Insulin, which lowers blood sugar and glucagon, which raises it, are the most well-known of the hormones involved.
- Blood sugar levels are regulated by negative feedback in order to keep the body in balance
- There are several other causes for an increase in blood sugar levels. Among them are the 'stress' hormones such as epinephrine (also known as adrenaline), several of the steroids infections, trauma, and the ingestion of food.
- Diabetes mellitus type 1 is caused by insufficient or non-existent production of insulin while type 2 is primarily due to a decreased response to insulin in the tissues of the body (insulin resistance)
- **Both types of diabetes**, if untreated, result in too much glucose remaining in the blood (hyperglycemia) and many of the same complications

Also, too much insulin and/or exercise without enough corresponding food intake in diabetics can result in low blood sugar (hypoglycemia).

Ques.13 Write a short note on carbohydrates.

Ans- INTRODUCTION

- All living cells require energy to carry out various cellular activities
- This energy is stored in the chemical bonds or organic molecules like carbohydrates, fats, and proteins that we eat as food.
- These organic molecules are broken down by enzymatic reactions in cells to generate energy in the form of adenosine triphosphate (ATP).
- The ATP generated by these pathways in cells is used to drive various cellular processes.
- The food we consume is mainly comprised of proteins, carbohydrates, and fats. These are first broken down into their smaller units: like proteins into amino acids, carbohydrates into sugars (Glucose) and fats into fatty acids and glycerol.
- This process of digestion occurs outside the cell.

METABOLISM OF CARBOHYDRATES

- Carbohydrate metabolism begins with digestion. In the small intestine where monosaccharides are absorbed into the blood stream.
- Carbohydrates are the major source of energy for the living cells.
- Glucose is the central molecule in carbohydrate metabolism since all the major pathways of
- carbohydrate metabolism relates to it.
- Glucose is utilized as a major source of energy; it is synthesized from non-carbohydrate metabolism relate to it.
- Blood sugar concentrations are controlled by three hormones: insulin, glucagon, and epinephrine.

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

- If the concentration of glucose in the blood is too high, insulin is secreted by the pancreas.
- Insulin stimulates the transfer of glucose into the cells, especially in the liver and muscles, although other organs are also able to metabolize glucose,
- In the liver and muscles, most of the glucose is changed into glycogen by the process of **glycogenesis** (anabolism). Glycogen is stored in the liver and muscles until needed at some later time when glucose levels are low.

Ques.14 What is oxidative phosphorylation.

Ans- Oxidative Phosphorylation

- Oxidative phosphorylation is the fourth step of cellular respiration, and produces the most of the energy in cellular respiration.
- Oxidative phosphorylation, the process where electron transport from the energy
- precursors from the citric acid cycle (step 3) leads to the phosphorylation of ADP. Producing ATP. This also occurs in the mitochondria.
- Oxidative phosphorylation is the series of energy transformations that are called cellular respiration or simply respiration. First, carbon fuels are oxidized in the citric acid cycle to yield electrons with high transfer potential. Then, this electron-motive force is converted into a proton-motive force and finally, the proton-motive force is converted into phosphoryl transfer potential.
- The conversion of electron-motive force into proton-motive force is carried out by three electron-driven proton pumps-NADII-Q oxidoreductase, Q-cytochrome c oxidoreductase, and cytochrome c oxidase.
- These large transmembrane complexes contain multiple oxidation-reduction centers, including quinones, flavins, iron-sulfur clusters, hemes, and copper ions.
- The final phase of oxidative phosphorylation is carried out by ATP synthase, an ATP synthesizing assembly that is driven by the flow of protons back into the mitochondrial matrix. Components of this remarkable enzyme rotate as part of its catalytic mechanism.
- Oxidative phosphorylation shows that proton gradients are an interconvertible currency of free energy in biological systems.

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

Very Short Answers

1. Nucleic acids combine with which biomolecule?
(a) Fats
(b) Carbohydrates
(c) Proteins
(d) Lipids

2. Nucleotides are linked together to form nucleic acid through which type of bond?
(a) Glycosidic bond
(b) Phosphodiester bond
(c) Both (a) and (b))
(d) None of these

3. Nucleotides have how many components?
(a) 5
(b) 4
(c) 3
(d) 2

4. If a compound does not contain the phosphate group. It is known as:
(a) Nucleoside
(b) Nucleotide
(c) Both (a) and (b)
(d) None of these

5. Which of the following is a purine base?
(a) Aderine (A)
(b) Uracil (U)
(c) Thymine (T)
(d) All of these

6. Which of the following is a pyrimidine base?
(a) Uracil (U)
(b) Cytosine (C)
(c) Thymine (T)
(d) All of these

7. Which of the following base is not present in RNA?
(a) Uracil (U)
(b) Adenine (A)
(c) Thymine (T)
(d) Guainine (G)

8. DNA present in :
(a) Nucleus

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

(b) Mitochondria
(c) Cytoplasm
(d) Both (a) and (b)

9. RNA present in:
(a) Cytoplasm
(b) Nucleus
(c) Mitochondria
(d) Both (a) and (b)

10. In most of the nucleotides, the phosphate group is attached to which carbon of pentos sugar?
(a) C-l
(b) C-2
(c) C-4
(d) C-5

11.What is the full form of AMP?
(a) Adenine mini-phosphate
(b) Aldehyde mono-phosphate
(c) Alcohol mono-phosphate
(d) None of these

12. Identify the purine base of nucleic acids in the following:
(a) Cytosine
(b) Thymine
(c) Uracil
(d) Adenine

13. Which of the following are not the components of RNA?
(a) Thymine
(b) Adenine
(c) Guainine
(d) Cytosine

14. What is the composition of nucleoside?
(a) A sugar a phosphate
(b) A base + sugar
(c) A base a phosphate
(d) A base + sugar + phosphate

15. What is the composition of nucleotide?
(a) a sugar+a phosphate
(b) A base + a sugar
(c) a base + a phosphate
(d) A base + a sugar + phosphate

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

16.Group of adjacent nucleotides are joined by:
(a) Phosphodiester bond
(b) Peptide bond
(c) Electrovalent bond
(d) Covalent bond

17. The sugar molecule in a nucleotide is :
(a) Hexose
(b) Pentose
(c) Tetrose
(d)Triose

18. Building blocks of nucleic acids are:
(a) Histones
(b) Amino acids
(c) Nucleosides
(d) Nucleotides

19. The repeating units in both DNA and RNA are called:
(a) Amino acids
(b) H-bonds
(c) Nucleic acids
(d) Nucleotides

20. The sugar that is in the backbone of RNA is called:
(a) Deoxyribose
(b) Fructose
(c) Ribose
(d) Sucrose

21. What is the structure of DNA?
(a) A double helix
(b) A strand
(c) A stranded molecule
(d) None of these

22. Which of the following is an enzyme?
(a) Urease
(c) Thymine
(b) Glycine
(d) Uracil

23. Factors affecting enzyme actions are:
(a) Temperature
(b) pH value
(c) Presence of electrolyte
(d) All of these

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

24. Lock and key model for enzyme action is given by:
(a) Emil Fischer
(b) Million
(c) Hopkins-Cote
(d) None of these

25. Which of the following best describes a particular enzyme?
(a) Chemical catalyst
(b) Fibrous protein
(c) Highly selective
(d) Can be used for various reactions

26. Enzymes are generally named after the:
(a) Compound on which they work
(b) Medium in which they act
(c) Compound which they form as product
(d) Place from where they are derived

27. The enzyme which catalyses the conversion of proteins to amino acids is:
(a) Invertase
(b) Urease
(c) Nuclease
(d) Protease

28. Enzymes are regarded as :
(a) Biocatalysts
(b) Messengers
(c) Inhibitors
(d) Antibodies

29. The Prosthetic groups which get attached to the enzyme at the time of reaction are called:
(a) Cofactors
(b) Coenzymes
(c) Messengers
(d) Inhibitors

30. Identify the correct statement about enzymes:
(a) Enzymes increase the activation energy of a reaction
(b) Enzymes need to be used in excess compared to the request to catalyse the reaction
(c) Enzymes work only at their optimum temperature and pH
(d) The activity of enzymes cannot be affected by other compounds.

31. is an enzyme used to dissolve blood clots.
(a) Uricase
(b) Lysozyme
(c) Urokinase
(d) Asparginase

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

32. Which of the following enzyme is used in the treatment of cancer?
(a) Trypsin
(b) Lysozyme
(c) Asparginase
(d) Streptokinase

33. _____is used in the treatment of skin ulcers:
(a) Collagenase
(b) Glutaminase
(c) Rhodanose
(d) Ribonuclease

34. Which of the following enzyme is used as therapeutic enzyme in treating allergies caused by penicillin?
(a) Rhodanose
(b) Uricase
(c) B-Laetamase
(d) Hyaluronidase

35. Antibacterial: Lysozyme :: inflammation:
(a) Ribonuclease
(b) Trypsin
(c) Hyaluronidase
(d) Collagenase

36. How many classes are enzymes divided into
(a) 6
(b) 7
(c) 5
(d) 8

37. Which of the following is the essential nutrient for a woman during her initial stages of pregnancy to prevent birth defects?
(a) Thiamin
(b) Folic acid
(c) Vitamin C
(d) Vitamin E

38. Which of the following food sources has the highest levels of vitamin C ?
(a) Parsley
(b) Broccoli
(c) Black carrot
(d) Orange

39. Which of the following vitamins help in blood clotting:
(a) Vitamin K
(b) Vitamin C
(c) Vitamin D
(d) Vitamin E

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

40. Which is the leading cause of blindness in children:
(a) Glaucoma
(b) Cataracts
(c) Color blindness
(d) Deficiency of Vitamin A

41. Beri-Beri disease is caused by the deficiency of:
(a) Vitamin B_{12}
(b) Vitamin B_1
(c) Vitamin B_6
(d) Vitamin B_2

42. Scurvy disease is caused by the deficiency of vitamin :
(a) Vitamin C
(b) Vitamin A
(c) Vitamin D
(d) Vitamin B complex

43. Vitamin ……..... act as hormone and visual pigment:
(a) Thiamine
(b) Retinal
(c) Riboflavin
(d) Folic acid

44. Megoloblastic anaemia is caused by the deficiency of:
(a) Folic acid
(b) Niacin
(c) Pyridoxine
(d) Cobalamin

45. Name the fat soluble vitamin:
(a) Vitamin C
(b) Vitamin B
(c) Vitamin K
(d) Vitamin B

46. Pellagra is caused by the deficiency of:
(a) Niacin
(b) Vitamin
(c) Vitamin D
(d) Riboflavin

47..... acts as hormone processor.
(a) Vitamin A
(b) Vitamin D
(c) Vitamin C
(d) Vitamin K

48. Which of the following is a component of the coenzyme A ?
(a) Retinal
(b) Pyridoxine

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

(c) retinoic acid
(d) Pantothenic acid

49. Which of the following vitamins is also known as cobalamin :
(a) Vitamin B2
(b) Vitamin B,
(c) Vitamin B,
(d) Vitamin B

50. Which of the following vitamins has a coenzyme function:
(a) Vitamin A
(b) Vitamin 8
(c) Vitamin C
(d) All of these

51..... is the best source of vitamin A.
(a) Poultry
(b) Legumes
(c) Sweat Potato
(d) Dairy Products

52. Name the water soluble vitamin:
(a) Vitamin B,
(b) Vitamin C
(c) Vitamin B,
(d) All of these

53..... is the scientific name of vitamin K.
(a) Ascorbic acid
(b) Phytonadione
(c) Tocopherol
(d) Pantothenic acid

54. Weakness in muscles and increase in the fragility of red blood cells is caused due to the:
(a) Deficiency of vitamin E
(b) Deficiency of vitamin C
(c) Deficiency of vitamin A
(d) Deficiency of vitamin D

55. Who is susceptible to developing scurvy (Vitamin C deficiency)?
(a) A Pregnant woman
(b) A malnourished child
(c) A long time alcoholic person
(d) None of these

56. Which is the another name of vitamin C ?
(a) Ascorbic acid
(b) Thiamine
(c) Riboflavin
(d) Retinal

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

57. Which of the following enzymes is considered as defective in Galactosemia a fatal genetic disorder in infants?
(a) Glucokinase
(b) Galactokinase
(c) Galactose-1-Phosphate Uri dyltransferose
(d) UDP-Galactose-4-epimerase

58. Erythrocytes undergo glycolysis for production of ATP. The deficiency of which curyme leads to hemolytic Anemia 2
(a) Glucokinase
(b) Phosphofructokinase
(c) Phosphoglucomutase
(d) Pyruvate Kinase

59. The most active site of protein synthesis is the:
(a) Nucleus
(b) Ribosome
(c) Mitrocondrion
(d) Cell soap

60. How many total molecules of ATP are synthesized from ADP via glycolysis of a single molecule of glucose?
(a) 36
(b) 38
(c) 2
(d) 4

61. The role of absorption of sugars by the small intestine is highest for:
(a) Pentoses
(b) Disaccharides
(c) Polysaccharides
(d) Hexoses

62. An essential for the conversion of glucose to glycogen in liver is:
(a) UTP
(b) GTP
(c) pyruvate kinase
(d) Guanosine

63. Glycogen synthesis is increased by:
(a) Cortisone
(b) Insulin
(c) GH
(d) Epinephrine

64. Gluconeogensis occurs in the liver and which organ:
(a) Kidney
(b) Muscle
(c) Heart
(d) Fat

65. The first product of glycogenolysis is:

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

(a) Glucose-6-Phosphate
(b) Glucose 1, 6 diphosphate
(c) Glucose-1-Phosphate
(d) Fructose-1 Phosphate

66. Enzymes concerned with the citric acid cycle are found in the:
(a) Nucleus
(b) Ribosomes
(c) Mitochondria
(d) Cytoplasm

67. The net gain of ATP during conversion of glucose to pyruvate is:
(a) 1 ATP
(b) 2 ATP
(c) 1 ATP + 1 GTP
(d) 4 ATP

68. The end product of glycolysis under anaerobic conditions is:
(a) Lactic acid
(b) Pyruvic acid
(c) Autoacetic acid
(d) Oxaloacetic acid

69. Name the most active organ in the animal body which have the ability to synthesize triacylglycerol?
(a) Spleen
(b) Kidney
(c) Liver and intestines
(d) Adipose tissues

70. What is lipolysis?
(a) Hydrolysis of triacylglycerol
(b) Formation of lipids
(c) Breakdown of ketone bodies
(d) Formation of ketone bodies

71. Which of the following hormone is not used in the hydrolysis of triacylglycerol into the fatty acids in adipose tissues?
(a) Epinephrine
(b) Norepinephrine
(c) Glucagon
(d) lnsulin

72. Which of the following enzyme is not used in the synthesis of triacylglycerol?
(a) Glycerol-3-Phosphate acyltransferase
(b) Acylglycerophosphate acyltransferase
(c) Phosphatidic acid Phospao hydrolase
(d) Glycogen Phosphrylase

73. Triacylglycerol packed with the apoliprotein and cholesterol in lipoprotein aggregate is called:
(a) Chylomicrons
(b) VLDL

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

(c) HDL
(d) LDL

74. What is the outcome of the accumulation of acetyl CO-A in the mitochondria of the liver:
(a) It is used as an energy source
(b) It has broken down into free fatty acids
(c) It gets converted to oxaloacetate
(d) It forms ketone bodies

75. Name the energy source of the brain during starvation:
(a) Fat
(b) Ketone bodies
(c) Protein
(d) Lipids

76. What is the biosynthetic source of all steroid hormones?
(a) Cholesterol
(b) Ketone bodies
(c) Carbohydrate
(d) Protein

77. Tranasmination reaction in amino acid synthesis is catalysed by enzyme:
(a) Decorboxylase
(c) Glutamate decarboxylase
(b) Aminotransferase
(d) Nitric oxidic synthase

78. Intermediates of which of the following metabolic pathway have not been used in the synthesis of amino acids?
(a) Glycolysis
(b) Fatty acid biosynthesis
(c) Citric acid cycle
(d) Pentose phosphate pathway

79. Name the amino acid which does not take part in transamination during amino acid catabolism?
(a) Proline
(b) Threonine
(c) Lysine
(d) Serine

80. Name those living organisms which secrete nitrogen in the form of urea ?
(a) Urectelic
(b) Unicotelic
(c) Ammonotelic
(d) Nitroso compounds

81. Name the type of cell in which synthesis of urea cycle takes place.
(a) Pancreatic cell
(b) Hepatocyte
(c) Bowman's gland cell
(d) Urinary epithelium cell

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE & SUBSCRIBE PHARMACY INDIA LIVE CHANNEL

82. Which of these is a hereditary disease caused due to an error in amino acid metabolism?
(a) Phenylketonuria
(b) Albinism
(c) Homocystinuria
(d) Ketoacid Urea

PHARMACY INDIA