

1) Enzyme Kinetics.3

Enzyme Kinetics. *Enzymes are protein catalysts that, like all catalysts, speed up the rate of a*

chemical reaction without being used up in the process.

Enzyme kinetics is the study of the chemical reactions that are catalysed by enzymes. In enzyme kinetics, the reaction rate is measured and the effects of varying the conditions of the reaction are investigated. Studying an enzyme's kinetics in this way can reveal the catalytic mechanism of this enzyme, its role in metabolism, how its activity is controlled, and how a drug or an agonist might inhibit the enzyme. Enzyme kinetics is the investigation of how substrate bind with enzyme them into product. They are used to kinetic analysis are commonly obtained from an enzyme.

In 1913 the leonor Machalis and Muad leonora Menton are proposed quantative theory of enzyme. The molecules of the substrate bind reversibly with enzyme are called enzyme substrate complex. These molecules are converted into product are called enzyme product complex.

These theory are further are further developed by J.B.S haldan and G.E briggs who derived equation to still widely used today. Enzyme Kinetics depend upon the solution condition and saturation concertration.

- **Acrolein Test**

Acrolein test. *Acrolein test is used to detect the presence of glycerol or fat. When fat is treated strongly in the presence of a dehydrating agent like potassium bisulphate (KHSO₄), the glycerol portion of the molecule is dehydrated to form an unsaturated aldehyde, **acrolein** that has a pungent irritating odour*

- **Nucleotides Composition**

*Nucleotides are the building blocks of **nucleic acids**; they are composed of three subunit molecules: a **nitrogenous base**, a five-carbon sugar (ribose or **deoxyribose**), and at least one **phosphate** group. A nucleoside is **anitrogenous base** and a 5-carbon sugar.*

- **Hydrogenation Of Fats**

Hydrogenation converts liquid vegetable oils into solid or semi-solid **fats**, such as those present in margarine. Changing the degree of saturation of the **fat** changes some important physical properties, such as the melting range, which is why liquid oils become semi-solid.

- **N Glycosidic Bond**

A glycosidic bond or glycosidic linkage is a type of covalent bond that joins a carbohydrate molecule to another group, which may or may not be another carbohydrate

- **Write The Composition Of Triacylglycerols?**

*The Chemistry of Triglycerides. A triglyceride is a lipid molecule made up of one unit of **glycerol** and three **fatty acids**, hence the tri- prefix, which means three. A triglyceride looks a little bit like a creature with three tails. The head is **glycerol**, which is a simple alcohol compound.*

• **Write Two Examples Of Cyclic Nucleotide?**

Cyclic nucleotide has three components. It contains a nitrogenous base (meaning it contains nitrogen); for example, adenine in cAMP and guanine in cGMP. It also contains a sugar, specifically the five-carbon ribose. And finally, a **cyclic nucleotide** contains a phosphate.

Hydrolytic rancidity refers to the odor that develops when triglycerides are hydrolyzed and free fatty acids are released. This reaction of lipid with water may require a catalyst, leading to the formation of free fatty acids and glycerol. In particular, short-chain fatty acids, such as butyric acid, are malodorous.

halogenation with respect to fat 5 marks

Halogenation

- Similar to hydrogenation,
- Halogens such as chlorine, bromine and iodine can also be added to double bonds in unsaturated fatty acids.
- It is a very important property to determine the degree of unsaturation of the fat or oil that determines its biological value.
- The degree of unsaturation is reflected by iodine number.
- Iodine number is defined as the number of grams of iodine absorbed by 100 gm of fat.
- The more the iodine number, the greater the degree of unsaturation.
- Fats rich in saturated fatty acids have low iodine numbers,
- while fats rich in unsaturated fatty acids have high iodine numbers
- The determination of iodine number is useful to the chemist in determining the quality of an oil or its freedom from adulteration
- Iodine number of cotton seed oil varies from 103 to 111.
- That of olive oil from 79 to 88,
- And that of linseed oil from 175 to 202
- A commercial lot of olive oil which has iodine number higher than 88 might have been adulterated with cotton seed oil
- The higher is the iodine number, the more reactive, less stable, more susceptible to oxidation and rancidification is the oil or fat.

• **What Do You Know About Km Of Michaelis-Menten Equation?**

In biochemistry, Michaelis-Menten kinetics is one of the best-known models of enzyme kinetics.

It is named after German biochemist Leonor Michaelis and Canadian physician Maud Menten.

The **Michaelis-Menten equation** can then be rewritten as $V = \frac{K_{cat} [Enzyme] [S]}{(K_m + [S])}$. K_{cat} is equal to K_2 , and it measures the number of substrate molecules "turned over" by

enzyme per second Taking the reciprocal of both side of the **Michaelis-Menten equation** gives: To determine the values of K_m and V_{max} .

- **Tautomerism:** • All these bases can exist in keto-enol or amine-imine form. • At physiologic pH keto and amine form is predominant.
- **UV light absorbance:** The conjugated double bonds of purine and pyrimidine derivatives absorb ultraviolet light
- **Hydrophobicity:** • The purine and pyrimidine bases are hydrophobic and relatively insoluble in water at the near neutral cell pH
- **Weak Bases:** Purines or pyrimidines with an $-NH_2$ group are weak bases
- **Heterocyclic:** • They are heterocyclic i.e. structures that contain other atoms in addition to carbon, such as nitrogen in the ring structure
- **Aromatic:** The Nitrogen containing bases are aromatic i.e. they have alternate double bonds

• What Are Enzymes? Write Its Classification With Example?

A several complex protein that are produced by cell and act as catalysts by specific biochemical reaction.

There were six classes of **enzymes** that were created so that **enzymes** could easily be named. These classes are: Oxidoreductases, Transferases, Hydrolases, Lyases, Isomerases, and Ligases. This is the international **classification** used for **enzymes**.

• Five Properties Of Waxes?

Waxes are insoluble in water, but soluble in fat solvents and are

- negative for acrolein test.

- very resistant to rancidity.

Waxes are not easily hydrolyzed as the fats

- and are indigestible by lipases (enzymes responsible for fat digestion in body) • Thus they are of no nutritional value

• Difference Between Thymine And Uracil?

Thymine becomes thymidine and deoxythymidine, Thymine is 2,4-dioxy-5-methyl-pyrimidine,

Thymine (T)—only in DNA. Uracil (U) becomes uridine and deoxyuridine, Uracil is 2,4-dioxypyrimidine, Uracil (U)—only in RNA. T and U differ by only one methyl group, which is present on T but absent on U.

• Spermaceti

Spermaceti • is a wax that is most often found in the head cavities of the sperm whale. • Fatty

esters are formed essentially of • cetyl palmitate and • cetyl myristate. It was used in cosmetics,

pharmacy and also in candles • recent international regulation concerning whale captures, has

stopped its use. It is now replaced by synthetic cetyl palmitate.

• Lipoprotein

Combinations of lipid and protein (lipoproteins) serve as the means of transporting lipids in the

blood, Importantly, lipids provide the hydrophobic barrier that permits partitioning the aqueous

contents of cells and subcellular structures as; phospholipids and sterols are the major structural elements of biological membranes.

- Different combinations of lipids and proteins produce particles of different densities
- ranging from chylomicrons to high-density lipoproteins

• Examples Of Coenzymes?

FAD, (Flavin Adenine Dinucleotide), NAD⁺ (Nicotinamide adenine Dinucleotide) and NADP⁺

(Nicotinamide adenine Dinucleotide Phosphate)

• Properties Of Glycerol

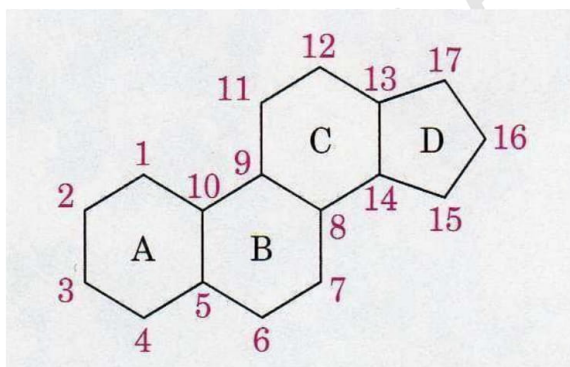
It has the following properties: • Colorless • Viscous oily liquid with • sweet taste

Primary Structure Of DNA

In **DNA** double helix, the two strands of **DNA** are held together by hydrogen bonds. The nucleotides on one strand base pairs with the nucleotide on the other strand. The secondary **structure** is responsible for the shape that the nucleic acid assumes. The bases in the **DNA** are classified as purines and pyrimidines.

Steroids and Cholesterol

- A steroid is a lipid whose structure is based on the tetracyclic (four-ring) structure consists of
- 3 cyclohexane rings.
- 1 cyclopentane ring.



- Steroids with eight to ten carbon atoms in the side chain at C-17 and a hydroxyl group at C-3 are classified as sterols

1. Tags Physical Properties?

Glycerol is widely used in pharmaceutical and cosmetic preparations.

Physical properties • Neutral fats are 1. colourless, 2. odorless and 3. tasteless substances

1. Buffer Defn And Its Composition?

A **buffer** solution (more precisely, pH **buffer** or hydrogen ion **buffer**) is an aqueous solution consisting of a mixture of a weak acid and its conjugate base, or vice versa. Its pH changes very little when a small amount of strong acid or base is added to it.

To relatively the maintaining the pH of the solution, a buffer must consist of the acid-base pair meaning

either:

- i) A weak base and a conjugate acid.
- ii) ii) A weak acid and conjugate base . The use of one or more ,depend upon the desired pH when preparing the buffer.

Example:

- iii) Acetic acid such as sodium acetate (CH_3COOH) in which they have conjugate acid . Ammonia(NH_3) and a salt(NaCl) in which they have conjugate base.

Nucleic Acid Medical Application?

Applications of nucleic acid testing in diagnosis and therapy. **Nucleic acid** testing or **nucleic acid** amplification testing, often abbreviated as NAT or NAAT, is a technique that involves amplification and detection of genetic material—the **nucleic acids**, DNA or RNA—for diagnosis or to provide guidance on therapy . as anti-viral drugs such as in the treatment of AIDS.

Two properties of glycerol trinitrate. 2 marks

- Glycerol combines with three molecules of nitric acid to form Glycerol trinitrate that is used as
- explosive and
- vasodilator

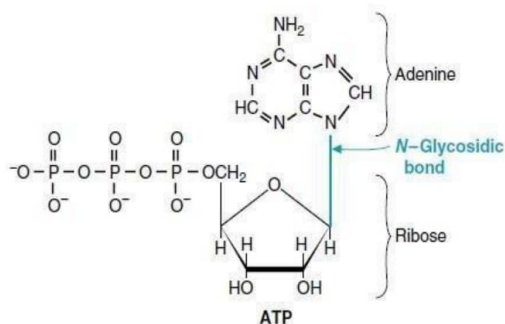
1. Differentiate Between Oxidative And Hydrolytic Rancidity?

2. Oxidative rancidity is a natural process that affects fats and oil.

Hydrolytic rancidity refers to the odor that develops when triglycerides are hydrolyzed and free fatty acids are released. This reaction of lipid with water may require a catalyst, leading to the formation of free fatty acids and glycerol. In particular, short-chain fatty acids, such as butyric acid, are malodorous

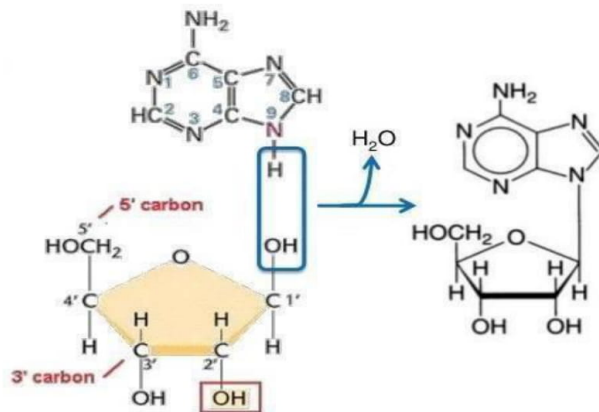
example of condensation reaction .2mrks

- Sugars are linked to the heterocycle by a β -N-glycosidic bond, almost always to the
- N-1 of a pyrimidine
- N-9 of a purine



- The N-glycosyl bond is formed by removal of the elements of water
- a hydroxyl group from the pentose and

- hydrogen from the base



- Thus it is a condensation reaction.
- Similar to O-glycosidic bond formation in carbohydrates
- However, N-glycosidic bonds, have Nitrogen atom instead of oxygen linking the two residues. • the addition of the glycosidic bond to nitrogenous base is indicated by the name change
- such as from adenine to adenosine for the glycosidic bond

Write Three Functions Of cGMP?

Cyclic guanosine monophosphate (cGMP) is a cyclic nucleotide derived from guanosine triphosphate (GTP). cGMP acts as a second messenger much like cyclic AMP. Its most likely mechanism of action is activation of intracellular protein kinases in response to the binding of membrane-impermeable peptide hormones to the external cell surface

. Write Hydrogenation Process With Respect To Fats?

During **hydrogenation**, vegetable oils are reacted with hydrogen gas at about 60°C. A nickel catalyst is used to speed up the reaction. The double bonds are converted to single bonds in the reaction. In this way unsaturated fats can be made into saturated fats – they are hardened.

Role Of Nucleotides As Coenzyme And Intermediate Carrier?

ATP, an adenine **nucleotide**, is a universal energy currency in the cells of biological systems. Adenine **nucleotides** are components of three major **coenzymes**, NAD^+ , FAD, and CoA, organic molecules that assist in various biochemical reactions by serving as carriers. **Nucleotides** also function as regulators of metabolism.

Energy currency 5

Energy currency: Nucleotides play an important role as "energy currency" in the cell.

- Nucleoside tri- and diphosphates such as ATP and ADP are the principal donors and acceptors of phosphoryl group in metabolism.
- By doing this, they play a key role in the energy transduction.
- This energy is used in almost every energy requiring process in the body, such as;
- Muscle contraction, Transmission of nerve impulse, Transports of nutrients across cell membrane Motility of spermatozoa And many more energy dependent processes.

iodine number

- Iodine number is defined as the number of grams of iodine absorbed by 100 gm of fat.
- The more the iodine number, the greater the degree of unsaturation.
- Fats rich in saturated fatty acids have low iodine numbers,
- while fats rich in unsaturated fatty acids have high iodine numbers

Characters Of Vldl?

very-low-density lipoproteins (VLDL),

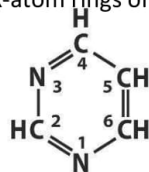
- VLDLs are assembled in the liver.
- composed predominantly of TAGs synthesized in liver and
- contain some cholesterol and cholesteryl esters
- As VLDL pass through the circulation, TAG is degraded and taken up by peripheral tissues in the form of fatty acids,
- causing the VLDL to decrease in size and become denser,

called VLDL remnant.

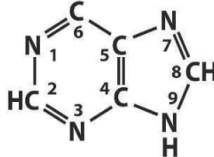
write five Properties of nitrogenous bases. 5 marks

Properties of Nitrogenous Bases

- **Aromatic:** The Nitrogen containing bases are aromatic i.e. they have alternate double bonds
- *Heterocyclic:*
- They are heterocyclic i.e. structures that contain other atoms in addition to carbon, such as nitrogen in the ring structure
- The six-atom rings of purines and pyrimidines are numbered in opposite directions.



Pyrimidine



Purine

- **Weak Bases:** Purines or pyrimidines with an -NH_2 group are weak bases
- **Functional Groups:** The most important functional groups of pyrimidines and purines are
 - ring nitrogens
 - carbonyl groups
 - exocyclic amino groups
- **Hydrophobicity:** • The purine and pyrimidine bases are hydrophobic and relatively insoluble in water at the near-neutral cell pH
- **Stacking Interaction:** Hydrophobic stacking interactions in which two or more bases are positioned with the planes of their rings parallel (like a stack of coins) are one of two important modes of interaction between bases in nucleic acids.
- Base stacking helps to minimize contact of the bases with water, and these interactions are very important in stabilizing the three-dimensional structure of nucleic acids.

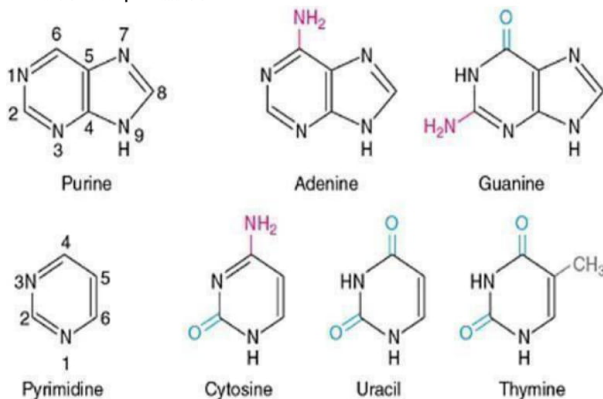
carbon atom number in pentose sugar of nucleotides & nucleosides

Numbering of Carbon and Nitrogen Atoms

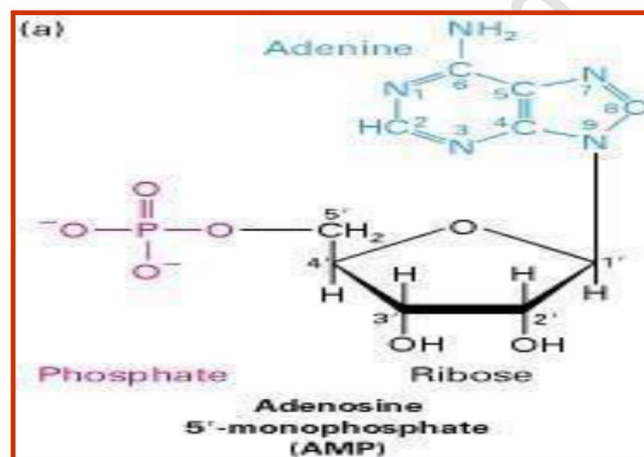
- The carbon and nitrogen atoms in the rings of the base and the sugar are numbered

separately

- The atoms in the rings of the bases are numbered
- 1 to 6 in pyrimidines &
- 1 to 9 in purines



- In the pentoses of nucleotides and nucleosides the carbon numbers are given a prime (') designation to distinguish them from the numbered atoms of the nitrogenous base.
- The carbons in the pentose are numbered 1' to 5'.
- Numerals with a prime (e.g., 2' or 3') distinguish atoms of the sugar from those of the heterocycle.



- Thus, when the 5'-carbon of a nucleoside (or nucleotide) is referred to, a carbon atom in the pentose, rather than an atom in the base, is being specified.

Nucleotides serve as single transduction pathway?

- serve as second messengers in signal transduction pathways.
Signal Transduction: GTP and GDP play key roles in activating or inhibiting proteins in various cellular signaling cascades.
- Medical applications Specifically medical applications include the use of synthetic purine and pyrimidine analogs that contain halogens, thiols, or additional nitrogen atoms;
- Their use includes chemotherapy for cancer
- as suppressors of the immune response during organ transplantation. as anti-viral drugs such as in the treatment of AIDS

define function of lipoxin 2 marks

- The lipoxins are formed through the action of 15-lipoxygenase followed by the

action of 5-lipoxygenase on arachidonic acid.

- A series of reductions of the resultant hydro-per-oxy groups leads to the formation of tri-hydroxy derivatives of arachidonic acid known as the lipoxins.
-
- Lipoxins induce chemotaxis and stimulate superoxide radicals for killing of microorganisms
- Prostaglandins, thromboxanes, leukotrienes and lipoxins have very short half lives and rapidly degraded in the body.

Nucleoside vs. Nucleotide

A **nucleoside** consists of a nitrogenous base covalently attached to a sugar (ribose or deoxyribose) but without the phosphate group. A

Sir Arslan

nucleotide consists of a nitrogenous base, a sugar (ribose or deoxyribose) and one to three phosphate groups.

Nucleoside = Sugar + Base

Nucleotide = Sugar + Base + Phosphate

Comparison chart

Nucleoside versus Nucleotide comparison chart

Nucleoside		Nucleotide	
Chemical Composition	Sugar + Base. A nucleoside consists of a nitrogenous base covalently attached to a sugar (ribose or deoxyribose) but without the phosphate group. When phosphate group of nucleotide is removed by hydrolysis, the structure remaining is nucleoside.	Sugar + Base + Phosphate. A nucleotide consists of a nitrogenous base , a sugar (ribose or deoxyribose) and one to three phosphate groups.	
Relevance in medicine	Several nucleoside analogues are used as antiviral or anticancer agents.	Malfunctioning nucleotides are one of the main causes of all cancers known of today.	
Examples	Examples of nucleosides include cytidine, uridine, adenosine, guanosine, thymidine and inosine.	Nucleotides follow the same names as nucleosides, but with the indication of phosphate groups. For example, 5'-uridine monophosphate.	

Nucleotide: Nucleotide is composed of a nitrogenous base, sugar and a phosphate group.

Nucleoside: Nucleoside is composed of only a nitrogenous base and a phosphate group

Define enzymes? Write classification of enzymes? (10 marks)

Enzymes are protein molecules in cells which work as catalysts. Enzymes speed up chemical reactions in the body, but do not get used up in the process. Almost all biochemical reactions in living things need enzymes. With an enzyme, chemical reactions go much faster than they would without the enzyme.

There were six classes of enzymes that were created so that enzymes could easily be named. These classes are:

1) Oxidoreductases, 2) Transferases, 3) Hydrolases, 4) Lyases, 5) Isomerases, 6) Ligases.

CLASSIFICATION OF ENZYMES		
Group of Enzyme	Reaction Catalysed	Examples
1. Oxidoreductases	Transfer of hydrogen and oxygen atoms or electrons from one substrate to another.	Dehydrogenases Oxidases
2. Transferases	Transfer of a specific group (a phosphate or methyl etc.) from one substrate to another.	Transaminase Kinases
3. Hydrolases	Hydrolysis of a substrate.	Estrases Digestive enzymes
4. Isomerases	Change of the molecular form of the substrate.	Phospho hexo Isomerase, Fumarase
5. Lyases	Nonhydrolytic removal of a group or addition of a group to a substrate.	Decarboxylases Aldolases
6. Ligases (Synthetases)	Joining of two molecules by the formation of new bonds.	Citric acid synthetase

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1) Oxidoreductases

- catalyze oxidation reduction reactions
- further divided into four subgroups;
- Oxidase,
- Dehydrogenases, • Hydroperoxidases • Oxygenases.

2) Transferases

- These bring about a transfer of functional groups such as
- phosphate and
- amino group

from one molecule to another molecule called donor and acceptor molecules respectively

- The common examples of this group are
- Transminases
- Phosphotransfrases (Kinases)
- Hexokinase is a phosphotransfease which catalyze the transfer of phosphate groups.
- $\text{Glucose} + \text{ATP} \rightarrow \text{Glucose 6-phosphate} + \text{ADP}$.

3) Hydrolases

- These enzymes catalyze hydrolysis, i.e.
- add water molecule to the substrate which is simultaneously decomposed; the functional group of substrate is transferred to water.
- Common example of hydrolases are:
- Protein hydrolyzing Enzymes (peptidases).
- Carbohydases
- Lipid hydrolyzing enzymes e.g. Lipases and • Phospholipases.

4) Lyases

- These enzymes catalyze the addition of
- NH_3 ,
- H_2O or
- CO_2 to double bonds or
- the removal of these groups leaving behind double bonds.
- Lyases are included in a separate class because they catalyze these reactions by means other than hydrolysis or oxidation.

5) Isomerases

These enzymes catalyze the structural change within a single molecule by the transfer of groups within it, resulting in the formation of an isomeric form of substrate.

6) Ligases

- These enzymes catalyze condensation reactions joining two molecules by forming
 - C-O,
 - C-S,
 - C-N and
 - C-C bonds.
- The energy for condensation is provided by cleavage of high energy phosphates, e.g. ATP, GTP etc.

Bee Wax?

Bees-wax is secreted by the honeybees that use it to form the combs. • It is a mixture of waxes

- chief constituent is myricyl palmitate

tRNA?

Once at the ribosome, an initiator **tRNA** binds the amino acid to the ribosome to start translation. It carries the amino acids and binds to the Messenger RNA (mRNA) to form proteins Each **tRNA** can be used repeatedly to be transcribed from DNA in nucleus.

Lipoxins

Lipoxins, an acronym for lipoxygenase interaction products, are bioactive autacoid metabolites of arachidonic acid made by various cell types.

Define saponification Number? (3marks)

The number of milligrams of the sodium hydroxide and potassium hydroxide of free or combined state of fats or wax to completely saponifying are called Saponification number.

- Saponification
- Hydrolysis of a fat by an alkali is called saponification
- The resultant products are glycerol and the alkali salts of the fatty acids, which are called "soaps"
- The number of mgs of NaOH/KOH required to saponify the free and combined FA in one gram of a given fat is called its saponification number The amount of alkali needed to saponify a given quantity of fat will depend upon the number of carboxylic (–COOH) group present
- Thus fats containing short chain fatty acids will have more –COOH groups per gram than long- chain fatty acids and this will take up more alkali
- And hence will have higher saponification number

What is meant by rancidity and what is rancidity of fats?

- Rancidity
- Definition:
 - It is a physico-chemical change in the natural properties of the fat leading to the development of unpleasant odor or taste or abnormal color
 - It occurs particularly on aging after exposure to atmospheric oxygen, light, moisture, bacterial or fungal contamination and/or heat.
- Saturated fats resist rancidity more than unsaturated fats that have unsaturated double bonds.

- *Rancidity is due to*
- Oxidation • Hydrolysis • Oxidative Rancidity

Rancidity is a very general term and in its most general **meaning**, it refers to the spoilage of a food in such a way that it becomes undesirable (and usually unsafe) for consumption. When people say that a food has "gone bad," what they're usually talking about is **rancidity**.

Rancidification. **Rancidity** is the complete or incomplete oxidation or hydrolysis of **fats** and oils when exposed to air, light, moisture or by bacterial action, resulting in unpleasant taste and odor. When these processes occur in food, undesirable odors and flavors can result.

What is the composition of bile?

The **composition** of gallbladder **bile** is 97% water, 0.7% **bile** salts, 0.2% bilirubin, 0.51% fats (cholesterol, fatty acids, and lecithin), and 200 meq/l inorganic salts.

What is the interactions of DNA?

DNA-binding proteins are proteins that have **DNA**-binding domains and thus have a specific or general affinity for single- or double-stranded **DNA**. Sequence-specific **DNA**-binding proteins generally **interact** with the major groove of B-**DNA**, because it exposes more functional groups that identify a base pair.

. What is enzyme kinematics?

Enzyme kinetics involves the measurement of the rate at which chemical reactions that are catalyzed by enzymes occur. Knowledge about the kinetics of an enzyme can reveal useful information about its catalytic mechanism, role in metabolism, factors that impact its activity, and mechanisms of inhibition

Five Function cAMP?

Short ans

cAMP, cyclic AMP, or 3',5'-cyclic adenosine monophosphate) is a second messenger important in many biological processes. **cAMP** is a derivative of adenosine triphosphate (ATP) and used for intracellular signal transduction in many different organisms, conveying the **cAMP**- dependent pathway.

Long ans

Combinations of lipid and protein (lipoproteins) serve as the means of transporting lipids in the blood, Importantly, lipids provide the hydrophobic barrier that permits partitioning the aqueous contents of cells and subcellular structures as; phospholipids and sterols are the major structural elements of biological membranes.

- Different combinations of lipids and proteins produce particles of different densities
- ranging from chylomicrons to high-density lipoproteins

A **lipoprotein** is a **biochemical** assembly whose primary purpose is to transport **hydrophobic lipid** (a.k.a. **fat**) molecules in water, as in blood or **extracellular fluid**. They have a single-layer **phospholipid** and

cholesterol outer shell, with the hydrophilic portions oriented outward toward the surrounding water and lipophilic portions of each molecule oriented inwards toward the lipids molecules within the particles.

five functions of cyclic AMP 5

- Acts as second messenger in the cell
- It has role in glycogen metabolism
- cAMP, glycogenolysis
- cAMP TAG metabolism
- cAMP lipolysis
- It decreases cholesterol synthesis
- It causes activation of protein kinases which in turn activate or deactivate other enzymes.
- It regulates the cell membrane permeability, by increasing permeability of cell membrane to H₂O, Na⁺, K⁺ & Ca⁺²
- Moreover, it regulates
- insulin secretion, catecholamine biosynthesis & Melatonin synthesis
- Cyclic GMP is synthesized from GTP
- It serves as a second messenger in response to nitric oxide during relaxation of smooth muscle (especially blood vessels) so it has role in smooth muscle relaxation and vasodilatation.

It also has role in

- Protein phosphorylation
 - Neurotransmission
 - Insulin action
 - Regulation of sodium channels
- cAMP, cyclic AMP, or 3',5'-cyclic adenosine monophosphate) is a second messenger important in many biological processes. cAMP is a derivative of adenosine triphosphate (ATP) and used for intracellular signal transduction in many different organisms, conveying the cAMP-dependent pathway

TAGs Store in Plant and Vertibrate?

Triacylglycerols (TAGs), which consist of three fatty acids bound to a glycerol backbone, are major storage lipids that accumulate in developing seeds, flower petals, pollen grains, and fruits of innumerable plant species. These storage lipids are of great nutritional and nutraceutical value and, thus, are a common source of edible oils for human consumption and industrial purposes

Two Example of Purine bases?

two purine bases, adenine and guanine,

Three Example of Pyrimidine?

thymine, cytosine, and Uralic,

what is mean by protein folding?

Protein folding is a process by which a polypeptide chain **folds** to become a biologically active **protein** in its native 3D structure. ... The amino acids in the chain eventually interact with each other to form a well-defined, **folded protein**.

Name two second messenger of nucleotides? (2marks)

Second messengers: Nucleotides, such as

1. Cycloadenosine mono phosphate(cAMP)
2. Cyclic Gaunoadenosine mano phosphate(cGMP)

What are simple lipids? give two types of simple lipids. (2 marks)

A simple lipid is a fatty acids of different type of alcohol and carry no other substances . A simple lipid is belong to the heterogeneous class of predominantly non polar in nature. They are insoluble in water but soluble in organic solvent, such as chloroform and benzene. Simple Lipids: Fatty acids ester of different alcohol. Fats: Fatty acid ester of different glycerol. Oil and fats are in liquid state. They are insoluble in water but soluble in organic solvent such as chloroform and benzene. Waxes: Solid ester of fatty acid ester .They are insoluble in water due to weak polar nature of ester group.

Functional Groups:

The most important functional groups of pyrimidines and purines are

- ring nitrogens
- carbonyl groups
- exocyclic amino groups

Unnatural Pyrimidine Bases example

- Fluorouracil (5FU) & • 6-Aza Cytosine (AZC)

Function of tRNA

- The t RNA molecules serve as ADAPTERS for the translation of information in the sequence of nucleotides of the mRNA into specific amino acids.
- There is at least one (and often several) specific type of tRNA molecule for each of the amino acids commonly found in proteins.
- Each t RNA carries its specific amino acid to the site of protein synthesis.
- There it recognizes the genetic code word on mRNA (codon) and this specifies the addition of its amino acids to the growing peptide chain.

How light produce in fireflies

The light produced by fireflies is the result of a reaction involving the protein luciferin and ATP, catalyzed by the enzyme luciferase

RBC contain large amounts of the oxygen-transporting protein hemoglobin. (c) The protein keratin, formed by all vertebrates, is the chief structural component of hair, scales, horn, wool, nails, and feathers .

About Contractile Proteins :

- These proteins are involved in muscle contraction and relaxation – Myosin of thick filaments – Actin of thin filaments of skeletal muscles
- Structural proteins provide mechanical support e.g collagen
- Contractile proteins help in the movement of muscle fiber and microvilli
- Some proteins present in the cell membrane, cytoplasm and nucleus act as receptors

Function of bile

The emulsification of dietary fats in intestinal canal, brought about by bile salts, is a prerequisite for digestion and absorption of fats. • The bile salts, act to break apart the fat globules in the small intestines and allow them to become more "soluble" for absorption.

MCQ FINAL TERMS 2021 COLLECTION FILES

1. Reversible inhibitors binds through _____ Non Covalent bond
2. DNA disruption occurs in laboratory at _____ pH, Heated above 80°C or Salt concentration
3. Archidonic acids is formed by _____ Linoleic acid
4. Co enzymes are formed when proteins bind _____ Metallic , organic compound NAD etc
5. Chief components of bee wax is _____ myricyl palmitate
6. Bile is synthesized by _____ and stored in _____ - liver-Gallbladder
7. Eukaryotic ribosomes have 2 sub units _____ larger 60s and smaller 40s On. -14s

8. Kw of water at 25°C is 10^{-14} .
9. Michaelis-Menten kinetics is the exception for regulatory enzymes
10. Optimum pH of pepsin is pH 2
11. phosphorylation of sugar result in D-glucose-6-phosphate
12. No of Amino Acids often occur in B turns 2
13. Which doesnot occurs in α -Helices Glycine,
14. Side chain in sterols is at C17
15. DNA Helix two strand of DNA hold together by Hydrogen Bonding
16. pKa value of Alanine 2.32
17. Purine includes (Adenine and guanine)
18. Thymine and uracil are different by one methyl group (Methyl group)
19. Triacylglycerole are composed of three fatty acids and joined with one glycerol by Ester linkage
20. Which of the following is a Halogens chlorine, bromine and iodine
21. HDL contain 50% Protein
22. About 80-85% of CO₂ is carried in blood as bicarbonates
23. No of carbons in Palmitic Acid 16C
24. (RNA)—the "working copies" of the (DNA) -
25. The difference between the energy levels of the ground state and the transition state is the activation energy,
26. Aromatic Amino-Acids are Phenylalanine, Tyrosine and Tryptophan
27. Carbohydrates and lipids forms glycosphingolipids
28. Polyunsaturated Fatty Acids (PUFAs) contains no of double bonds (More than one)

29. Alpha shows the which structure of proteins **Secondary structure**
30. The conjugated **double bonds** of purine and pyrimidine derivatives **absorb ultraviolet light.**
31. The formula of slope is
$$\text{Slope} = \frac{K_m}{V_{\max} \cdot \text{app}}$$
32. At pH 12 predominant glycine is _____ **xH₂N-CH₂-COO-**
33. Simple triglycerides Fatty acids connected to glycerol are of the same type **eg. tripalmitin.**
34. Platelet aggregation is the culminating step in the cardiovascular diseases due to **atherosclerosis**
35. he aldehyde reduction product of glucose is the molecule **sorbitol**
36. glycerol is converted to glycerol 3 phosphate _____ by enzyme **dehydrogenase**
37. In DNA cytosine is 18% then adenine would be _____ **32%**
38. Which of the following is levulose _____ **Fructose**
39. One letter symbol of glycine is _____ **G**
40. Most proteins can be denatured by heat, which has complex effects on the weak interactions in a Protein **Hydrogen bonds**
41. Pyrimidine include in both DNA and RNA _____: **Cytosine (C)**
42. Both DNA and RNA contain the same _____ **Plurine bases**
43. Table sugar is ... **Sucrose**
44. PI of glycine is **5.97**
45. PL of alanine is **5.7**
46. Glutamate PI is **3.22**
47. PI of histidine..... **7.59**
48. Histandine has **3 Disassociate Hydrogen.**
49. 1 torr = **1mmHg**

50. carbamates account for about 15% of the CO₂ in venous blood
51. one gram of Glucono delta-lactone yields roughly the same amount of metabolic energy as one gram of sugar
52. Amino sugar is formed by removal of OH at C-2 of the parent monosachharide is replaced with an amino group.
53. Pk₃ of histidine is 9.2
54. Sunflower shaped Osazone Maltose
55. The symbol of tyrosine is Y
56. P50 is approximately 26.6mm Hg for hemoglobin
57. at 5' of DNA there is a free Phosphate group
58. Triple bond is present between Guanine and Cytosine
59. DNA sugars are linked to (N-1 of a pyrimidine or N-9 of a purine)
60. Major part of chylomicrons triacylglycerol 90%
61. Hb has a hybrid sigmoid, binding curve for O₂
62. Phosphatidylcholine is formed from (phosphatidic acid+Choline)
63. Blood Group Antigen present in all common blood types H
64. The Lineweaver-Burk plot is diagnostic for competitive inhibition
65. Enzymes catalyze condensation reaction joining two molecules by forming C-O, C-S, C-N and C-C bonds Ligase
66. Trans form of meliec acid is: fumaric acid
67. Fruit suger is : fructose.
68. Saminal fluid is rich in : lactose.
69. Simplest amino acid: glycine

70. in glycine R group is : H
71. Enthalpy denoted by : H
72. Negative charge on DNA is due to phosphate group
73. Iodine number of olive oil is : 79-88
74. VLDL composed of : TAG
75. Saturated lipids increase: LDL
76. PKA of glycine: 2.34

GRAND QUIZ SOLVED BY RAMZAN SOURO AND KERNAL CAPRICORN And SEHAR ZOOLOGIST

1. Long chain omega 3 fatty acid such as alpha linolic acid and their deravatives have _____ effects.

Inflammatory

Inhibitory

Antagonist

Anti-inflammatory

2. Which of the following statement about beta bend is False?

They are short region usually involving for successive amino acid residue.

They often connect strands of anti-parallel beta-sheets

They reverse the direction of a polypeptide chain , helping it form a compact, globular shape

For the formation of the bend, the carbonyl oxygen of the first residue forms a peptide bond with the amino-group hydrogen of the fourth residue.

3. In case of long chain fatty acids(LCFA) the -----portion is predominant

Hydrophobic

Hydro philic

4. The sigmoidal binding curve of hemoglobin for oxygen is possible due to----- structure of hemoglobin.

Multi-subunit

Single-subunit

5. Which of the following is example of derive lipid-----

Carotenoid

Steroid

Terpenes

All of above

6. How many amino acids in the alpha-chain of hemoglobin

141

146

543

144

7. The example of natural porphyrins include-----

Cytochrome C

Heamoglobin

Myoglobin

All options are correct

8. Amphipathic means that:

One end of the molecule is negative, the other is positive.

One end of the molecule is hydrophobic, the other hydrophilic

One end of the molecule is carbohydrate, the other is protein

All of given

9. Fatty Acids are classified on the basis of -----

Hydrocarbon chain length

Degree of saturation

Dietary Requirement

All of above

10. Out of 20 standard amino acids,----- contains a secondary amino group and is called an imino acid.

Proline

Serine
Methionine
Histidine

11. Which of the following is not a lipid?

Oil

Fat

Wax

Protein

12. -----is a fatty acid with one double bond and is abbreviated as 18:1

Palmitic acid
Glacial acetic acid
Tartaric acid

Oleic acid

13. The side chain of ----- amino acid are proton acceptors.

Acetic acid

Neativley charged

Lysine

Alpha carbon

14. In contract to myoglobin , hemoglobin can bind -----oxygen molecules one at each of the heme group

Four

Five
One
Two

15. The hydrolysis of sucrose to glucose and fructose Is catalyzed by sucrose, which is also present in the intestinal brush border like lactase and maltase. Sucrase is also known as

Invertase

Furanose
Glycogen dehydrogenase
Amylase

16. Which among the following is non-essential amino acid?

Serine

Threonine
Lysine
Histidine

17. Natural lipids are readily soluble in

Mercury

Oil

Water

Organic solvent

18. Protein present in cell membrane may function as ----- or transporters.

Receptors

Hormones

Immunoglobulin

Storage proteins

19. -----structure of proteins refers to particularly stable arrangement of amino acid residue giving rise to recurring structural patterns.

Primary

Secondary

Tertiary

Quaternary

20. The formation of furfural products and their condensation with organic phenols to give characteristic coloured compounds forms the basis of biochemical tests used for the detection of carbohydrates. An example of such test is

Molischs test

Benedict test

Ninhydrin test

Grease spot test

21. Which of the following occurs when hydrogen is reacted with vegetable oil?

The hydrogenated vegetable oil will contain fewer trans fats

The hydrogenated vegetable oil will become solid at room temperature

The hydrogenated vegetable oil will become polarized

The hydrogenated vegetable oil will become a saturated fat

22. The most frequently used systematic nomenclature names the fatty acid after the hydrocarbon with oic being substituted for the final

E

D

A

B

23. Some proteins contain additional amino acids that arise by modification of an amino acid already present in a peptide i.e, after the protein has been synthesized. An example of such an amino acid is:

Lysine

5-hydroxylysine

Peptidyl proline

Glutamic acid

24. All of the following are involved in stabilizing the three dimensional tertiary structure of proteins except:

Glycosidic bond

Hydrophobic interaction

Disulphide bridges

Hydrogen bond

25. The carbon atoms in fatty acids are numbered , beginning with the carbonyl carbon as----

C1

C2

C3

C4

26. The property of co-operative binding of oxygen to different subunits of macromolecules is applicable to-----

Heamoglobin

Myoglobin

27. The position of any _____ in fatty acids are specified relatives to the carboxyl carbon by superscript numbers following (delta)

Carbon atom

Hydrogen atom

Double bond

R-group

28. In secondary structure of protein _____ normally reflect the properties of R-group as _____

Beta pleated sheets, polar

Beta helix,aromatic

Alpha helix,non-polar

Secondary form of alpha helix, non-polar

29. In myoglobin and hemoglobin,heme is covalently linked with _____ amino acid(eighth residue of F helix)

Histidine F8

Alanine F8

Both

None of these

30. Based upon the properties the R group mainly polarity and abiity to interact with water, amino acids may be classified into _____main classes

two

three

five

eleven

31. A plot of degree of saturation (Y) measured at different partial pressure of oxygen (pO₂) is called

Oxygen dissociation curve

Carbon dissociation curve

Nitrogen dissociation curve

none

32. Carbon dioxide and water combine to form

Hydrogen carbon ion

Hydrogen ion

Hydrogen bicarbonate

Carbonic acid

33. Among aromatic amino acids _____ is polar while _____ is non polar.

Phenyl alanine , tyrosine

Tryptophan, lysine

Phenyl alanin, glycine

Tyrosine, alanine

34. Partial hydrogenation has an undesirable effect including _

Cis bond convert into trans

Trans bond convert into cis

35. All of the following are true for lactose EXCEPT

It is a reducing sugar

It is found abundant in grape juice

It is dextrorotatory

It is made up of galactose and glucose

36. In the lungs, the pH of blood is ____ because CO₂ is being exhaled

Neutral

Higher

Lower

Zero

37. Fats are the ____ fatty acids and glycerol

Esters

Ether

Isomer

Tautomer

38. Which of the following is example of derived lipids _____

Carotenoid

Steroid

Terpenes

All of above

39. Only haemoglobin dissociation curve bohr effect decreased affinity of haemoglobin for ____ gas caused by an increase of carbon dioxide pH etc.

Oxygen

Carbon dioxide

Ozone

Nitrogen

40. Which is the characteristic of biological membrane?

Membrane contain lipid that polymerize into one large molecule

Membrane contain protein and amphipathic lipids

Membrane have an asymmetrical micelle structure

Membrane have hydrophobic group on the surface

41. Histidine generally considered to be a ____ amino acid

Polar

Non-polar

42. Which statement best describes the domain found in the protein?

It is a section of protein structure sufficient to perform a particular chemical or physical task such as binding of a substrate or other ligand

It is simply a recognizable folding pattern involving two or more elements of secondary structure and the connection between them

It is the folding pattern of the secondary structural elements into a three-dimensional conformation

It is non regular secondary structure that does not have a repeating element

43. The Bohr Effect / Shift moves the oxygen saturation curve in what direction

Down and right

Down and left

44. Which of the following is positively charged at physiological pH?

Glutamate

Aspartate

Tyrosine

Arginine

45. The family of polyunsaturated fatty acids (PUFAs) with a double bond between the third and fourth carbon from the methyl end of the chain are of special importance in human _____

Mental health

Nutrition

46. Upon reaction with strong acids pentoses produce _____ with hexoses produce _____

Furfural, hydroxyl methyl furfural

hydroxyl methyl furfural, Furfural,

aldehydes, ketones

deoxy sugars, amino sugars

47. proteins involved in respiration include haemoglobin, myoglobin and _____

fibrin

cytochromes

cellulases

collagen

48. all amino acids except _____ have a chiral carbon and have two possible isomers.

Lysine

Glycine

Glutamic acid

Tryptophan

49. _____ is an example of contractile protein.

Myosin

Amylase

Haemoglobin

Fibrinogen

50. The protein or globin portion of myoglobin thus creates a special microenvironment for _____ that permits the reversible binding of one oxygen molecule (oxygenation)

Heme

Mg

Ca

None of the above

51. The partial pressure of oxygen needed to achieve half-saturation of the binding sites is called ____

P50

P60

P70

None

52. Which of the following are saturated fatty acids

Butyric acid

Linoleic acid

Palmitic acid

Oleic acid

53. The production of marrow cells takes place within:

The bone marrow

Liver

Spleen

Kidney

54. The binding of oxygen to one heme group enables an oxygen binding to the second heme group of the same hemoglobin molecule is called ____

Cooperative binding

Structural binding

Amino acid binding

Nucleic acid binding

55. Identify the amino acids containing non-polar, aliphatic R groups

Phenylalanine, tyrosine and tryptophan

Glycine, alanine, leucine

Lysine, arginine, histidine

Serine, threonine, cysteine

56. The process by which oxygen enters the blood from the alveoli is

Facilitated diffusion

Diffusion

Active transport

None

57. Many proteins have multiple polypeptide subunits (from two to hundred). A multisubunit protein is also referred to as a multimer.

the repeating structural unit in such a multimeric protein is called a ____

Protomer

Amino acid

Monosaccharides

Motif

58. occurring, genetically coded amino acids used by some methanogenic archaea.

Pyrrolysine

Phenylalanine

Aspartic acid

Sialic acid

59. Fatty acids are found in the unesterified form as ____ a transport from the plasma.

Oils

Free fatty acids

Esters

Bounded fatty acids

60. The pK₂ value for glycine is ____

2.34

5.97

9.60

7.65

61. What is the solubility of lipids in water?

Partially soluble

Soluble

Insoluble

Partially insoluble

62. The physical state of fat at room temperature is ____

Gas

Solid

Liquid

Plasma

63. The surface of myoglobin is polar, important for interacting with ____ aqueous environment of cytosol.

Polar

Non-polar

Organic

Inorganic

64. Oxygen stored in red muscle myoglobin is released during O₂ deprivation (e.g severe exercise)

To be used in muscle mitochondria for ____

Aerobic synthesis of ATP molecules

Anaerobic synthesis of ATP molecules

Aerobic synthesis of more O₂

Anaerobic synthesis of more CO₂

65. The property of co-operative binding of oxygen to different subunit of macromolecules is applicable to ____

Haemoglobin

Myoglobin

66. The ____ part of myoglobin does not directly interact with the heme, but helps stabilize the binding of oxygen to the ferrous iron

Distal histidine E7

Distal alanine

Distal copper

Iron

67. The side chain of ____ amino acids are proton acceptor

Acidic group

Negatively charged

Lysine

Alpha carbon

68) The following sterol is present in the cell membrane of fungi? Select the correct

option

Campesterol

Ergosterol

Stigmasterol

Sitosterol

69) A loss of three-dimensional structure sufficient to cause loss of function of the protein is called

Select the correct option

denaturation

catalysis reactivation

misfolding

70) Proteins present in cell membrane may function as or transporters.

Select the correct option **receptors**

hormones immunoglobulins storage

proteins

71) Phospholipids are molecules that contain

Select the correct option

positively charged functional groups **hydrophilic heads and**

hydrophobic tails Cholesterol and water

long water-soluble carbon chains

72) Disulphide bonds are formed between two molecules of the amino acid cysteine. The reaction involves:

Select the correct option **oxidation of**

sulfhydryl groups reduction of sulfhydryl

groups methylation of a carbon

phosphorylation of a carbon

73) A buffer is a solution that resists change in pH following the addition of an acid or base. Among amino acids, only

has an R group ($pK_a = 6.0$) providing significant buffering power near the neutral pH usually found in the intracellular and extracellular fluids of most animals. .

Select the correct option **histidine**

glycine glucose

aspartic acid

74) The surface of myoglobin is polar, important for interacting with ----- aqueous environment of cytosol.

Select the correct option **polar**

non polar organic

inorganic

75) Based upon the properties of the R group, mainly polarity and ability to interact with water, amino acids may be classified into main classes.

Select the correct option two

three **five**

eleven

76) Eicosanoids are derived from either fatty acids.

Select the correct option omega-3 (W-

3)

omega-6 (W-6) none of given

omega-3 (W-3) or omega-6 (W-6)

77) Which is a characteristic of all the fatty acid components in this lipid? Select the correct option

They all are hydrophilic because they contain oxygen. **They all contain an unbranched carbon chain.**

They all contain unconjugated cis double bonds

They all are joined to glycerol through an ester bond.

78) Alpha helices are found in very diverse proteins such as which is a fibrous protein and which is a globular protein.

Select the correct option **keratin,**

myoglobin

keratin, amylase, myoglobin

cellulose, keratin

79) The names of saturated fatty acids end in one of the following suffixes. Select the correct option

-enoic

-ol

-dehyde

-anoic

80) Hydrogenated fats are used by many food producers to provide following properties

Select the correct option Provide rich

texture Increase shelf life Increase

melting point **All**

81) The partial pressure of oxygen needed to achieve half-saturation of the binding sites is called

Select the correct option **P50**

P60 P70

None

82) The following salt is water insoluble

Select the correct option

K

Na Mg

Zn

83) A plot of degree of saturation (Y) measured at different partial pressures of oxygen (pO_2) is called

Select the correct option **Oxygen**

dissociation curve Carbon

dissociation curve Nitrogen

dissociation curve None

84) The characteristic pH at which the net electric charge on amino acid molecule is zero is called

Select the correct option cationic pH

isoelectric point

ampholytic point

anionic point

85) The ----- part of myoglobin does not directly interact with the heme, but helps stabilize the binding of oxygen to the ferrous iron Select the correct

option

Distal histidine E7 Distal

alanine

Distal copper Iron

86) Apart from the 20 standard amino acids, some other amino acids may also be synthesized and become a part of the protein. An example of such an amino acid is which is a naturally occurring, genetically coded amino acid used by some methanogenic archaea.

Select the correct option

pyrrolysine phenylalanine

aspartic acid sialic
acid

87) Which of the following occurs when hydrogen is reacted with vegetable oil? Select the correct option

The hydrogenated vegetable oil will contain fewer Tran's fats.

The hydrogenated vegetable oil will become solid at room temperature.

The hydrogenated vegetable oil will become polarized.

The hydrogenated vegetable oil will become a saturated fat.

88) Poly unsaturated fatty acids (like alpha-linolenic acid) with a double bond between C-3 and C-4 are called fatty acids

Select the correct option omega-4

omega-3

omega-3,4

None of given

89) In secondary structure of protein the properties of R-Group as normally reflect. Select the correct option

Beta pleated sheets, polar Beta helix,

aromatic Alpha helix, non-polar

Secondary form of alpha helix, non-polar

90) The three dimensional structure of a protein must have an external surface appropriate for its environment. For example, plasma proteins contain amino acids on the surface to remain soluble in an aqueous environment.

Select the correct option hydrophobic

non-polar polar

neutral

91) Which of the following is positively charged at physiological pH? Select the correct option

Glutamate

Aspartate

Tyrosine

Arginine

92) How many amino acids in the α chain of hemoglobin.

Select the correct option **141**

146

543

144

93) Maltose comprises of two glucose molecules that are joined together by glycosidic linkage.

Select the correct option B (1-4)

B (1-2)

α (1 2)

α -(1,4)

94) Disulfide bonds most often stabilize the native structure of: Extracellular protein Dimeric protein Intracellular protein Multisubunit protein Which property can be shared by lipids and terpenes?

Both can be very hydrophobic molecule Both can

contain a saturated fatty acid Both can contain

isoprene

Both can form micelles

95) The net charge on alanine in acidic solution (pH less than 2) is Negative

Positive Neutral

First negative then become neutral

96) Which of the following fatty acids would have the lowest critical micelle concentration

C4-COOH C5-

COOH C6-

COOH C8-

COOH

97) Based on its structural similarity to other lipids, lipid most likely functions as _____

A vitamin required for vision A

membrane component An energy

storage molecule A sex hormone