(9)

64496

(15M)

Q1. Do as directed-

Define –

i) Carbohydrates are poly hydroxy aldehydes or ketones with a general formula (CH2O)n.

ii) When animal fat/oil reacts with aqueous NaOH or KOH, they form soap and glycerol. Since this reaction leads to the formation of soap, it is called the Saponification. Saponification no is defined as the mg of KOH required to hydrolyse1gram of fat or oil.

iii) Zwitter ion is a molecule with two or more functional groups, of which at least one has positive and one has negative electrical charge and the net charge on entire molecule is zero.

iv) Pitch of the helix-The pitch of a helix is the height of one complete helix turn, measured parallel to the axis of the helix.

Fill in the blanks-

v) Proteins are polymers of **L- α-amino acids.**
vi) The three-letter symbol for Glycine is **Gly.**
vii) The phosphor-protein found in milk is **casein.**

Give examples of –

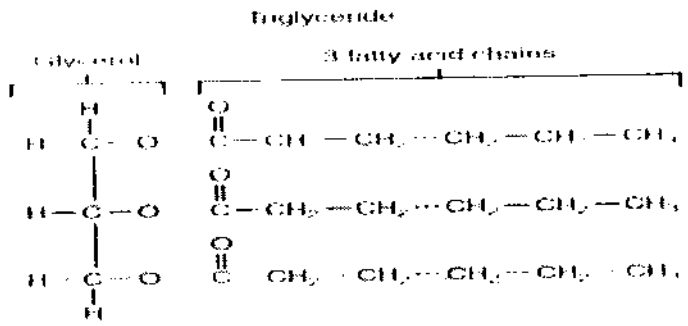
viii) Amino acids with hydroxyl group- serine, threonine, tyrosine.
ix) Storage proteins – ovalbumin, glutelin.
x) Keto Sugar
Fructose, ribulose
xi) Essential fatty acid
Linoelic acid, Linoleinic acd, arachidonic acid
xii) Lipoprotein
HDL,LDL,VLDL

Functions of

xiii) hnRNA.- Serve as precursor for mRNA and other RNAs
xiv) glutathione- serves as coenzyme for prostaglandin PGE2, synthetase, glyoxylase. It prevents oxidation of -SH group , maintains RBC membrane structure and integrity, protects haemoglobin from oxidation, involved in detoxication process, transport of amino acids in intestine and kidney. (any one function)

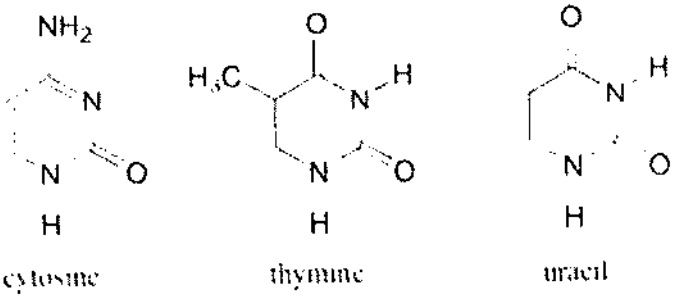
Draw structure of

(2)

xv) 

triacyl glycerol

xvi) D-ribulose



xvii) Pyrimidine base

xviii) State true or false: rRNA carries information from DNA for protein synthesis.- False

xix) Name the sugar present in DNA.-Deoxyribose

xx) Name the type of bond present between base pair G-C -Hydrogen bond

Q2 a) structure and function of cholesterol (08M)

(4M structure 4 M Functions)

3

[illegible] exclusive of animal origin

[illegible] membrane

[illegible] of lipoproteins found in blood

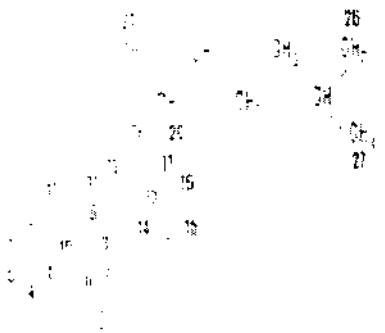
[illegible]

[illegible] components **(4M)**

[illegible] four ring structure known as cyclopentane perhydrophenanthrene

[illegible] group –OH is attached to C3

[illegible] (C27H46O)



Q2b) (7M)

Explain the structure and function of cellulose.

Cellulose-

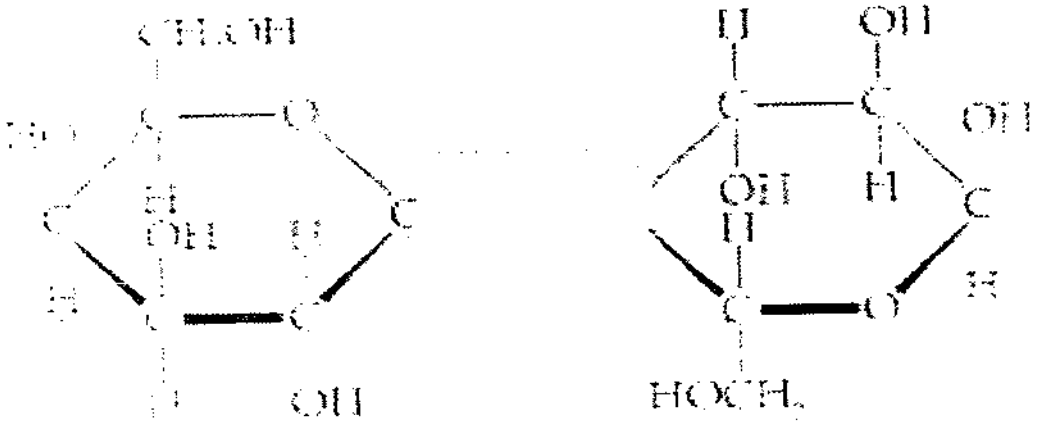
-present in plant

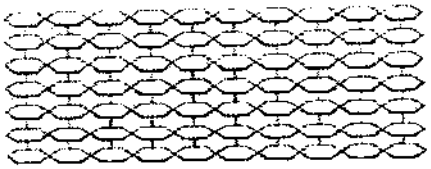
-Structural homopolysaccharide

-mol.wt. 2-20 lack

-1250 to 12500 glucose unit per molecule

-bonding present is β 1,4 in this linear molecule





Cellulose (fiber)

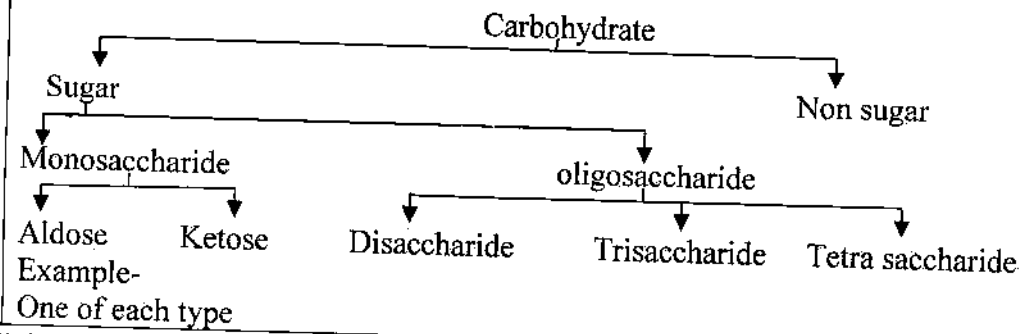
Function-

Any 3

OR

(5)

Q2c.

c)	**What is carbohydrate? Give its classification in detail.** Carbohydrate- Carbohydrates are poly hydroxy aldehydes or ketones . general formula- $(CH_2O)n$. Classification-  Example- One of each type	**8 M**

Q2d (7M)

Fatty acids are carboxylic acid with hydrocarbon side chain. General formula is R-COOH. The hydrocarbon side chain may be saturated or unsaturated in nature

SFA	USFA
Saturated fatty acids don't have unsaturation or double bonds in their structure	Unsaturated fatty acids have one or more double bonds in their structure
Their general formula is R- COOH	-
SFA's is found in animal sources	USFA s is found in plant based sources.
They are solids at room temperature Eg ghee , butter	They are liquids at room temperature. They are popularly called as oils

Butyric acid- $CH_3-CH_2-CH_2-COOH$	EG: Palmitolic acid has one double bond- C16:9
Palmitic acid- $CH_3-(CH_2)_{14}-COOH$	Oleic acid has one double bond- C18:9
Lauric acid - $CH_3-(CH_2)_{10}-COOH$	Leinoleic acid has three double bonds- C18: 9,12, 15 Aarachidonic acid has four double bond- C20:5,8,11,14
4M for each category	

Q3 a) classification of amino acids based on structure- (08M)

i) Amino acids with aliphatic side chains- consists of most simple amino acids. Glycine , alanine, valine ,leucine and isoleucine.

ii) Amino acids containing hydroxyl group- serine, threonine, tyrosine

iii) Sulphur containing amino acids- cysteine with sulfhydryl group, methionine with thioether group and cystine with bisulfide group.

iv) Acidic amino acids and their amides- aspartic acid and glutamic acid and their amide derivatives asparagine and glutamine. Possess distinct codons for their incorporation into proteins.

v) Basic amino acids- lysine, arginine (with guanidino group) and histidine (with imidazole ring). highly basic in character.

vi) Aromatic amino acids- phenylalanine, tyrosine and tryptophan (with indole ring).(histidine can also be considered in this category)

vii) Imino acids- Proline with pyrrolidine ring , has an imino group (=NH) instead of amino group.

Q3.b) Denaturation of proteins- (07M)

The phenomenon of disorganization of native protein structure is known as denaturation. Denaturation results in the loss of secondary, tertiary and quaternary structure of proteins. This involves a change in physical, chemical and biological properties of protein molecules.(2M)

Agents of denaturation- (2M)

Physical agents- heat, violent shaking, X-rays, UV radiations.

Chemical agents- acids, alkalis, organic solvents (ether, alcohol) salts of heavy metals (Pb,Hg), urea, salicylate.

Characteristics- (3M)

i) The native helical structure of protein is lost.

ii) The primary structure with peptide linkage remains intact.

iii) Denatured protein becomes insoluble in the solvent in which it was originally soluble.

iv) The protein loses its biological activity.

v) Viscosity increases while surface tension decreases.

vi) Denaturation is associated with increase in ionizable and sulfhydryl groups in protein. This is due to loss of H and disulphide bonds.

vii) Denatured protein is easily digested. This is due to increased exposure of peptide bonds to enzymes. Cooking causes denaturation hence, cooked food is more easily digested.

viii) Denaturation is usually irreversible.

ix) Careful denaturation is sometimes reversible (renaturation). Haemoglobin undergoes denaturation in the presence of salicylate. By removal of salicylate, haemoglobin is renatured.

x) Denatured proteins cannot be crystallized.

OR

Q3.c) properties of proteins- (08M)

i) Solubility- proteins form colloidal solutions instead of true solutions in water. This is due

ii) to huge size of the protein molecule.

iii) Molecular weight- proteins vary in their molecular weight, which, in turn, is dependent on number of amino acid residues. Insulin- 5,700 Myoglobin- 1,700 haemoglobin- 64,450 Serum albumin- 69,000 etc.

iv) Shape- it may be globular (insulin) , oval (albumin) fibrous or elongated (fibrinogen).

v) Isoelectric pH- pI is the pH at which the protein is neutral .t isoelectric pH , the proteins exist as dipolar or Zwitter ion. They do not migrate in the electric field. Minimum

solubility, maximum perceptibility and least buffering capacity. pI of pepsin- 4.6, human albumin- 4.7, urease- 5.0, haemoglobin-6.7, lysosome- 11.0

vi) Acidic and basic proteins- proteins in which the ratio (ε Lys+εArg/εGlu+ εAsp) is greater than 1 are referred to as basic proteins. For acidic proteins, the ratio is less than1.

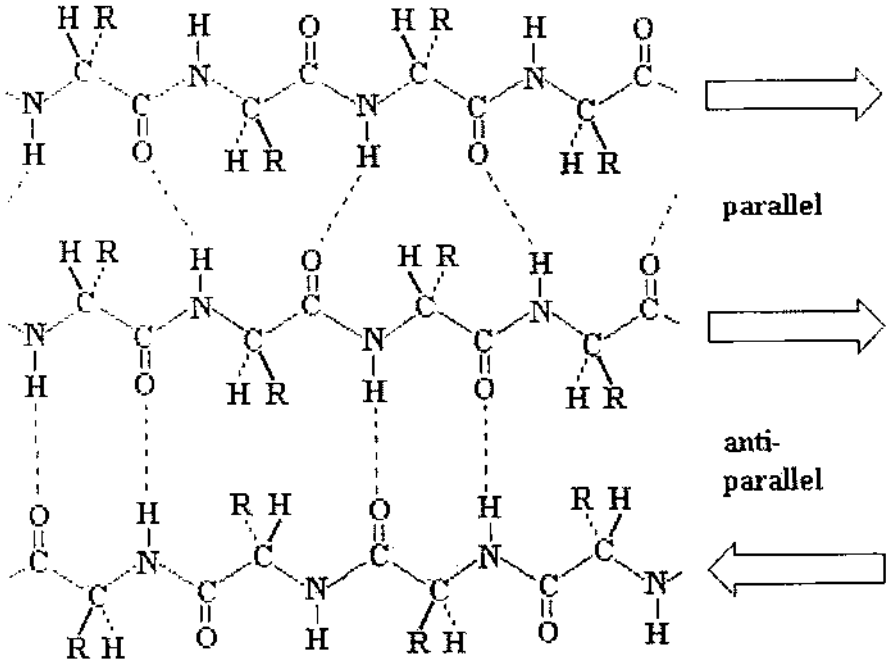
vii) Precipitation of proteins- can be precipitated by dehydration or neutralization of polar groups. Proteins are least soluble at **pI** , get easily precipitated when pH is adjusted to their isoelectric pH. Eg. Formation of curd from milk. Process of protein precipitation by **addition of neutral salts** like ammonium sulphate, sodium sulphate is called salting **out**. This is due to dehydration of protein molecules by salts. **Precipitation by salts of heavy metals** like Pb, Hg, Fe, Zn, Cd etc. **Precipitation by alkaloid reagents-** trichloroacetic acid, sulphosalicylic acid, phosphotungstic acid, picric acid, tannic acid, phosphomolybdic acid etc. **Precipitation by organic solvents** -alcohol.

viii) Colour reactions of proteins-the proteins give colour reactions which are useful to identify nature of amino acids present in them. E.g.Biuret reaction, Ninhydrin reaction , xanthoproteic reaction etc.

Q3.d) β pleated structure of proteins- (07M)

The conformation of polypeptide chain by twisting or folding is referred to as secondary structure. The amino acids are located close to each other in their sequence. Two types of secondary structures are mainly identified- α Helix and β-pleated sheet, proposed by Pauling and Corey. β Pleated sheets are composed of two or more segments of fully extended peptide chains. In the β sheets , the H bonds are formed between the neighbouring segments of polypeptides.

Parallel and antiparallel β sheets



The poly peptide chains in B-sheets may be arranged either by separate polypeptide chains or a single polypeptide chain folding back on to itself. Some fibrous proteins like β keratin and collagen have sheet like structure. Maximum number of H bonds are formed perpendicular to the long axis of poly peptide chains. The bonds exist between peptide bonds so that parallel or antiparallel sheet like structures are formed. Such proteins are fibrous and insoluble in aqueous solvents.

Q4. a) Diagrammatically explain Watson-Crick model of DNA. (08M)

Neat labeled diagram of double helical Watson-Crick model of DNA-4 Marks

Description of structure Any 6 points -4Marks

Q4.b) Give detail account of the components and functions of nucleotide. (07M)

Structural components of nucleotides- (3 M)

1) Nucleotides are the phosphoric acid esters of nucleotides. These occur either in the free form or as subunits in nucleic acids.

2) The component units of nucleotides are shown as follows:

DNA- Phosphate group + Deoxyribose sugar + Nitrogenous base

Nitrogenous base –Purine- Adenine and Guanine

Pyrimidine- Cytosine and Thymine

RNA- Phosphate group + Ribose sugar+ Nitrogenous bases

Nitrogenous base –Purine – Adenine and Guanine

Pyrimidine- Cytosine and Uracil

Functions of Nucleotides: (any 4 points- 4M)

1) As a carrier of chemical energy-ATP

2) As components of enzyme factors. / components of coenzymes: NAD, FAD etc.

3) Activated precursors of DNA and RNA

4) Metabolic regulators, eg- cAMP, cGMP

5) Required for activation of intermediates in many biosynthetic pathway

OR

Q4.c) In detail explain structure of tRNA (08M)

Neat labelled clover leaf model of t-RNA – (4M)

Clover leaf structure and it has 5 arms. (4M)

-CCA arms: cytosine –cytosine –adenine arm present at 3' end. It is an acceptor arm for attachment of amino acids to form amino acyl tRNA. -D-arm: contain dihydrouracil. - TψC arm: (thymidine-pseudo uridine-cytosine arm) contain pseudo uridine

-Anticodon arm: contains of sequence of three bases that are complementary to codon mRNA. - Extra arm: also called variable arm based on length of extra arm tRNa is classified into: class- 1 tRNA(contains short arm of 3-5 base pairs) and class-2 tRNA (contains long arm of 13- 20 base pairs)

Q4d)

	d) Compare and contrast the A and B form of DNA	7

9

Double helical DNA exist in many different forms like, A, B, C, D, E and Z. Out of which A, B and Z are important form. (1 M)

Characteristics	A-DNA	B-DNA
Helix sense	Right-handed	Right-handed
Helix- diameter	25.5°A	23.7°A
Rise per base pair	2.3°A	3.4°A
Base pair per turn of helix	11	10
Helix pitch	25.30°A	35.36°A
Shape	Broadest	Intermediate

(15 M)

Q.5 Short notes (any three)

a)

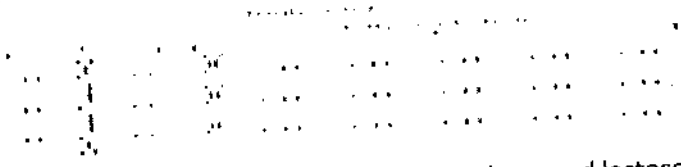
Types of triacylglycerol

Triacylglycerol- Neutral or depot fat. In Triacylglycerol, central glycerol molecule is condensed with three fatty acids. (1M)

If all the three fatty condensed are of the same type the molecule is called as simple TG and if more than one type of fatty acid is condensed, the molecule is known as mixed TG.(2M)

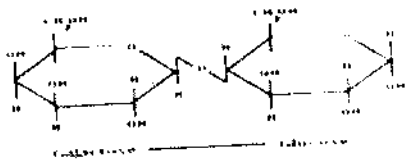
TG is the fat reserve of the body. It can be hydrolyzed and fatty acids can be beta oxidized whenever needed. Glycerol serves as a 3 carbon skeleton reserve, which undergoes gluconeogenesis in cases of hypoglycemia.

(2M structure, 2M types, 2M function)



(2M)

Q5.b) Compare and contrast between maltose and lactose

Maltose	Lactose
it s the principle sugar found in malt	it's the principle sugar found in milk.
Lactose is an important component used by dairy and Brewery	Lactose is an important component used by dairy and pharma industry
Maltose is composed of -D glucose linked to D glucose by means of a α 1→4 linkage	Lactose is composed of β -D galactose linked to D glucose by means of a β 1→4 linkage.
	

Q5 c) peptides and their importance-

Several peptides occur in the living organisms that display wide spectrum of biological functions. The term peptide is applied when number of constituent amino acids is less than 10.some examples of biologically active peptides and their functions-

1) Glutathione- tripeptide composed of 3 amino acids present in plants and animal tissues. Glutamic acid + cysteine + glycine . serves as coenzyme for prostaglandin PGE2, synthetase, glyoxylase.
   It prevents oxidation of -SH group , maintains RBC membrane structure and integrity, protects haemoglobin from oxidation, involved in detoxication process, transport of amino acids in intestine and kidney.
2) Thyrotropin releasing hormone (TRH)- tripeptide secreted by hypothalamus. Stimulates pituitary gland to release thyrotropic hormone.
3) Oxytocin- hormone secreted by posterior pituitary gland and contains 9 amino acids. I it causes contraction of uterus. Controls ejection of milk in females.
4) Vasopressin (antidiuretic hormone ADH)- nonapeptide produced by posterior pituitary gland. It stimulates kidneys to retain water and thus increases blood pressure.
5) Angiotensin – angiotensin I is decapeptide which is converted to angiotensin II . it has hypertensive effect and also stimulates release of aldosterone .
6) Methionine enkephalin- pentapeptide found in brain. Inhibit sense of pain
7) Bradykinin and kallidin- nona and decapeptides. Powerful vasodilator.
8) Peptide antibiotics (gramicidin, bacitracin, tyrocidine, actinomycin
9) Aspartame – dipeptide low calorie artificial sweetener in soft drinks
10) Gastrointestinal hormones- Gastrin ,secretin

Q5.d)

Ribosomal RNA.

It is the most stable form of RNA and is found in ribosome.

Most abundant of all types of RNAs and makes up to 80% of the total RNA of a cell

The ribosomes are the factories of protein synthesis. The eukaryotic ribosomes are composed of two major nucleoprotein complexex-60S and 40S subunit. The 60S subunit contains 28S rRNA , 5S rRNA and 5.8S rRNA while 40S subunit contains 18S rRNA. The function of rRNA in ribosomes is not clearly known. It is believed that they play a significant role in the binding of mRNA to ribosomes and protein synthesis.

Q5 e)

Chargaffs rule-

Chargaff's rules state that DNA from any cell of all organisms should have a 1:1 ratio (base Pair Rule) of pyrimidine and purine bases and, more specifically, that the amount of guanine should be equal to cytosine and the amount of adenine should be equal to thymine.

The ratio of A+T/G+C. known as dissymmetry ration varies greatly from one species of DNA to the other