SUMMER-16 EXAMINATION

Subject Code: **0808** **Model Answer** Page No: 1/ 36

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.

2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.

3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.

4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any

equivalent figure drawn.

5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.

6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.

7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q.1 Solve any eight of the following:

a) Define the following terms:(1 Mark each)

i) Iodine value

It is the number of grams of iodine required to saturate or absorbed by 100gms of fat.

ii)Saponification value

It is the number of milligram of KOH required to saponify i.e. hydrolyse the free and combined fatty acids in one gram of given fat or oil.

b) Explain the following terms: (1 Mark each)

i) Glycogenesis: It is the process of conversion of glucose into glycogen in the liver.

ii) Gluconeogenesis: It is the process of synthesis of glucose from non-carbohydrate sources such as amino acids, lactic acid and glycerol, etc.

c) Define and Classify the Vitamins

(1 mark for definition, 1 mark for classification)

The naturally occurring micronutrients present in food and are required for normal functioning and growth of the living organisms are called as a Vitamins.

Classification

- **Fat soluble vitamins:** these are soluble in fat and are stored in liver.
- Vitamin A, Vitamin D, Vitamin E and Vitamin K
- **Water soluble vitamins:** These are soluble in water and are not stored in body.
- Water soluble vitamin includes B-complex group(B_1, B_2 , B_3, B_5, B_6,B_{12}) and vitamin C.

d) Give biochemical functions and deficiency manifestations of Iodine.(1+1)

Fuctions (Any 2)

- Iodine is essential trace element required for the biosynthesis of thyroid hormones like thyroxine and triiodothyronine.
- It is required for the normal growth and development of body.
- About one third of the total body iodine is in thyroid gland, remaining is distributed in ovary, muscles, blood and all tissues

Deficiency:

- Goitre/ Hypothyroidism:

Use of iodised salt is useful in this condition

e) What are co- enzymes? Names co-enzymes derived from:(1+1 Mark)

Co enzymes are the organic molecules often derived from vitamin B complex group that participate directly in enzymatic reaction. Many enzymes catalyze the reactions only in presence of specific non protein organic molecules called the co enzyme.

i) Vitamin B_1 TPP (Thiamine pyrophosphate)

ii) Vitamin B_3 NAD(nicotinamide adenine dinucleotide) or

NADP(nicotinamide adenine dinucleotide phosphate)

f) Distinguish between Fats and Oils (2 Marks)

Fats	**Oils**
Fats are solids at room temp	These are liquid at room temp
Contain greater amounts of	Contain greater amounts of
Saturated fatty acids	unsaturated fatty acids
Acts as food reservoir	Mostly protective in functions
e. g. bees wax.	e. g. castor oil

g) What are reducing sugars? Give suitable examples.(1+1 Mark for any 2 Examples)

Carbohydrates having free & potential carbonyl function are called reducing sugars

They give Fehling's ,Benedict's , Tommer's and Osazone test positive

Eg. Glucose, lactose, maltose, fructose.

h) Enlist any four essential amino acids. (2 Marks)

Valine, leuciene, Isoleucine, phenylalanine, tryptophan, lysine, arginine, histidine,

methonine. (any 4 of these)

i) Define the term biochemistry. State its importance in biochemistry. (1+1Mark)

Biochemistry -The study dealing with the chemistry of living organism in its different phases of activity is called as biochemistry.

Significance: Any 2

1) It deals with study of living system and its working.

2) Study of nature and working of biomolecules.

3) Diagnosis of various metabolic disorder.

4) Study of various deficiency diseases.

5) Helps in synthesizing new molecules.

j) What happens when glucose is oxidized and reduced? (1+1 M)

Reduction of glucose: with hydrogen & platinum gives sorbitol as the carbonyl function gets reduced to alcohol.

Glucose ⟹ Sorbitol

Oxidation of glucose:

- with bromine gives Gluconic acid .
- With platinum it gives Glucuronic acid.
- With nitric acid it gives Glucosaccharic acid

k) Define. (1+1Mark)

i)**Anabolism:** It's a biosynthetic phase, uses energy to construct components of cells such as proteins and nucleic acids.

ii**)Catabolism :** It's a process of degradation of complex matter into simple form thus generating energy & metabolites that provide metabolic fuel & building block for the cell.

l) **Give the functions of (1+1Mark)**

i) Mitochondria

Mitochondria are engaged in oxidative metabolism, and are responsible for the transportation of chemical energy into biological energy, in the form of ATP compounds. All enzymes involved in Kreb's cycle are present in mitochondria.

ii) Endoplasmic reticulum :Any 2

- Give mechanical support, by forming skeletal network.
- Involves in the intracellular transport.
- Involves in the cellular metabolism.
- Carries protein synthesis, ATP synthesis, etc**.**

Q. 2 Solve any FOUR of the following

a) Define and classify carbohydrates

(Definition 1mark, 1 Marks classification and 1mark example)

Carbohydrates- It may be defined as polyhydroxy aldehydes or ketones or compounds which produce them on hydrolysis.

Classification-

1) Sugars (saccharides)

2) Non sugars (poly saccharides)

1) Sugars (saccharides)-

a) Monosaccharides (depending upon number of carbon atom, it is

subdivided in following types)

i) trioses-e.g. D-Glycerose

ii) tetroses-e.g. D-erythrose

iii) pentoses-e.g. D-ribose

iv) hexoses- e.g. glucose, fructose

Depending on functional group i) aldoses : Glucose

ii) ketoses : Fructose

b) Disaccharides- e.g. lactose, maltose, sucrose.

c) Oligosaccharides- e.g. raffinose, maltotriose.

2) Non sugars (poly saccharides)

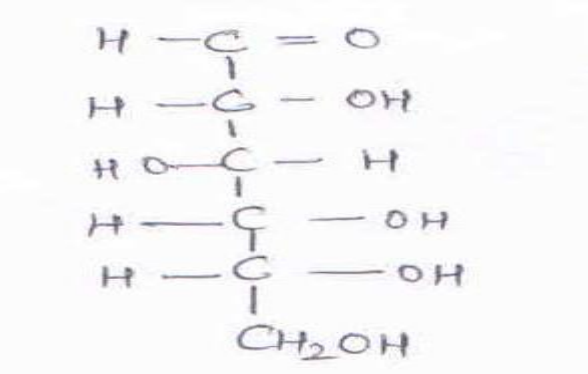
i) Homopolysaccharides-e.g. starch, cellulose.

ii) Heteropolysaccharides e. g. hyaluronic acid

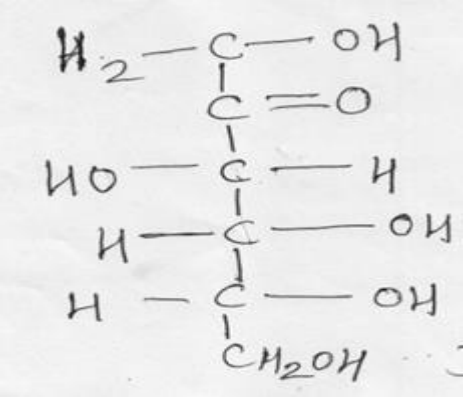
Schematic representation can also be considered

b) Write the structures of: (Any three structures for 3 marks)

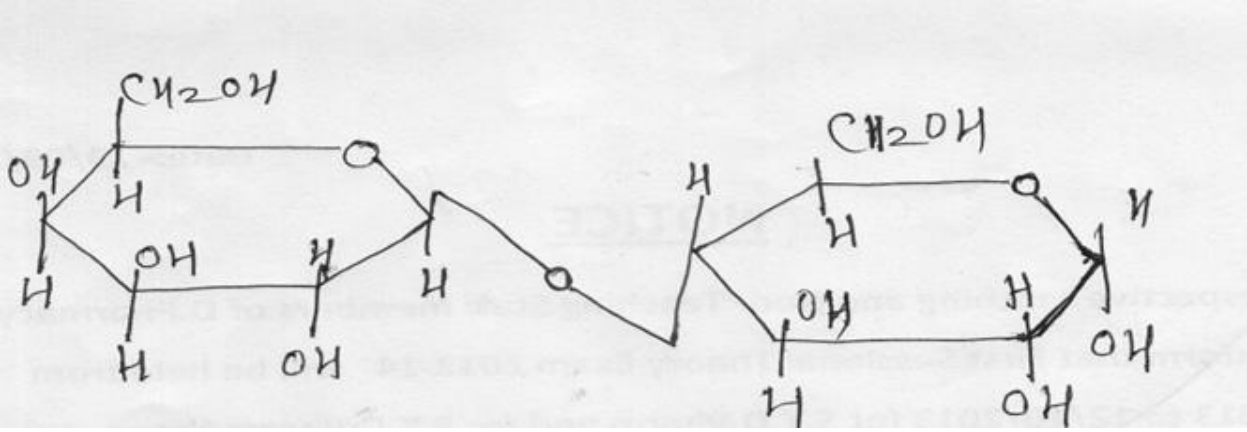
i) Glucose



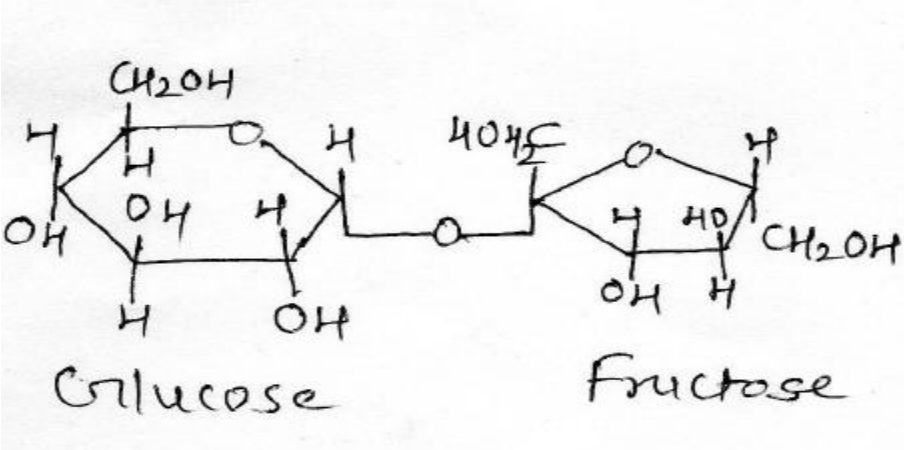
ii) Fructose



iii) Lactose



iv) Sucrose



c) Explain the following terms: (1.5Mark each)

i) Mutaroation: Change in specific rotation on standing aqueous solution of sugar is known as mutarotation.

When monosaccharide (glucose) is dissolved in water, its optical rotation gradually changes until it reaches a constant value, for eg. Freshly prepared solution of alpha D-glucose has a specific rotation of $+112^0$ and on standing specific rotation falls to $+52.5^0$ and remains constant at this value. This final stage can be obtained more quickly either by heating or by adding some catalyst like acid or alkali. This change in specific rotation is called as Mutarotation.

Fresh solution of beta D-glucose has rotation value of $+19^0$ which on standing also changes to $+52.5^0$

For example:

α—D—Glucose → D—Glucose ← β—D—Glucose.

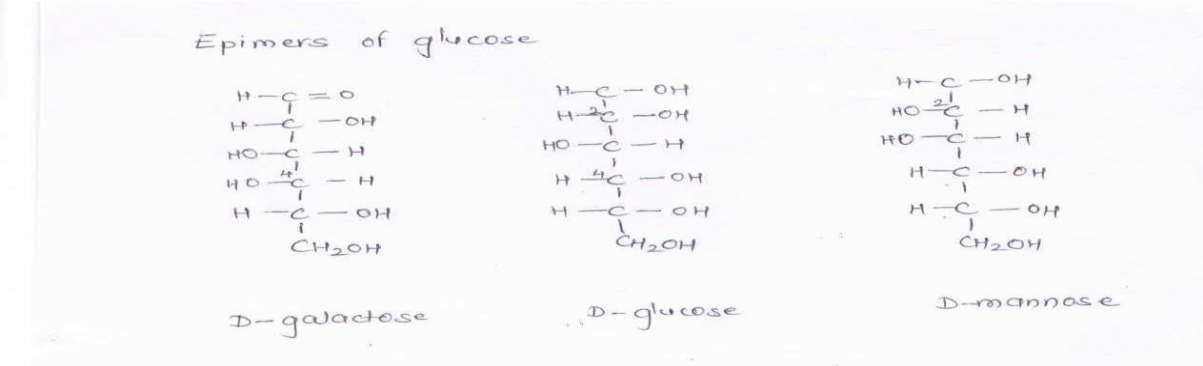
($+112^0$) ($+52.5^0$) ($+19^0$)

Fructose also exhibits mutarotation. In case of fructose the pyranose ring (six membered) is converted to furanose (five membered) ring, till an equilibrium is attained

ii) Epimerism

- If two monosaccharides differ from each other in the configuration around a single specific carbon (other than anomeric carbon) atom they are referred to as Epimers of each other.
- Glucose & galactose are epimers with regard to carbon 4 i.e. they differ in the arrangement of –OH group at C 4.
- Glucose & mannose are epimers with regard to carbon 2.

The interconversion of epimers is known as Epimerisation or Epimerism & a group of enzymes namely 'Epimerases' catalyze this reaction



d) Explain the role of lipids in biological membrane: (1.0 mark for explanation & 2 m for all diagrams)

The major component of biological membrane is phospholipid. Phospholipid has 2 long chains of hydrocarbon of fatty acids. The chains are hydrophobic and have strong polar group i.e. phosphate at 3rd carbon of glycerol. When phospholipids are added to aqueous medium they form micelles, monolayer & bilayer, depending on the concentration of phospholipids. The hydrophilic & hydrophobic interaction of phospholipids is forming bilayer in water. Hydrophobic tails are hidden from aqueous environment and form an internal hydrophobic phase whereas hydrophilic heads are exposed to the surface.Bilayer system of this type is extensively studied as model of natural membrane.

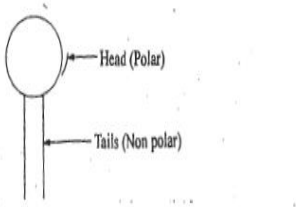


Fig. A molecule of phospholipid.

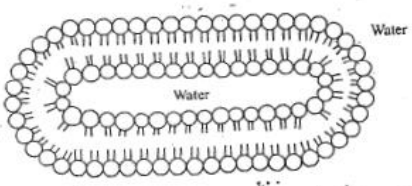
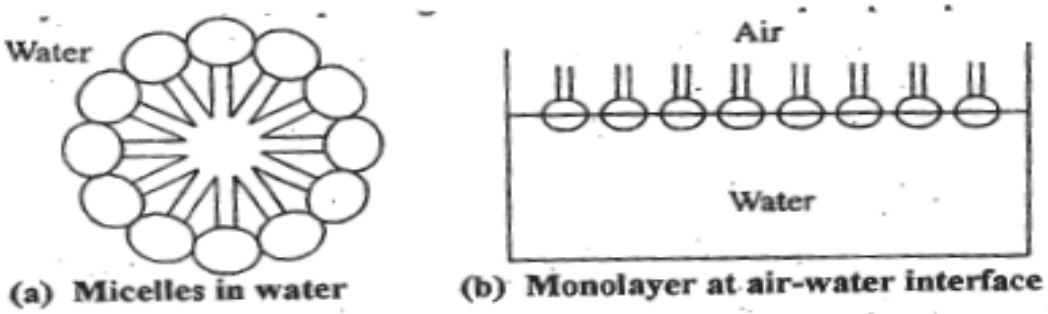


Fig. Phospholipid bilayer.



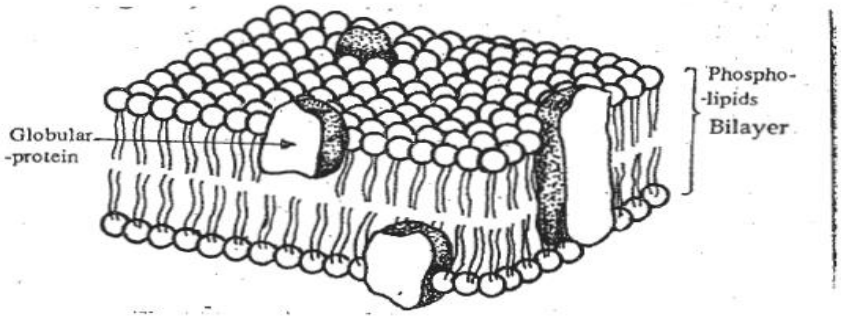


Fig. Fluid mosaic model of plasma membrane

Biomembranes are made up phospholipids lipoproteins, glycoproteins and proteins all these components are assembled together by non covalent interactions

e) What are proteins? Classify them, with suitable examples. (1+2 Mark)

Proteins are the naturally occurring highly complex compounds of amino acids joined together with peptide linkage (-CONH-) .

Classification -Based on chemical nature & solubility

- Simple: Composed of only amino acid residues.
- Conjugated: besides amino acid residues they contain nonprotein moiety known as prosthetic group or conjugating group.
- Derived: They are denatured or degraded products of simple or conjugated proteins.

PROTEINS

Simple	Conjugated	Derived
Globular :	Nucleoproteins	Primary:
• Albumins	Glycoproteins	Coagulated p.
• Globulins	Lipoproteis	Proteans
	Phosphproteins	
Scleroproteins:		Secondary:
• Elastins		Peptones
• Keratins		Peptides

Classification Based on the functions that they carry out OR Classification Based on nutritional value can also be considered.

f) Write any four biochemical functions of proteins. (3 Marks for any 4)

1] Some proteins are act as hormones and hence regulates various metabolic process e.g. insulin is responsible for maintaining blood sugar level.

2] Some proteins act as catalyst for biological reaction.

3] Some proteins act as biological structural materials viz collagen in connective tissue, keratin in hair.

4] Haemoglobin act as a oxygen carrier in mammals.

5] Some blood proteins help to form antibodies which provide resistance to disease so called as antibodies or defense proteins.

6] Nuceloproteins act as carrier of genetic characters.

7] Proteins which are required to carry out mechanical work are called muscle proteins.

Q. 3. Solve any four of the following

a) What is meant by (1.5Mark each)

i) Thermal denaturation

- The phenomenon of disorganization of native protein structure due to heat is known as Thermal denaturation.
- It results in loss of secondary, tertiary & quaternary structure of proteins.
- Primary structure with peptide linkages remains intact.(Peptide bonds are not hydrolyzed)
- This involves change in physical, chemical & biological properties of protein molecules.
- Denatured protein becomes insoluble.

ii) Rancidity

Fats and oils when exposed to light, air, heat, moisture for a longer time, develop disagreeable and objectionable odour. Such oil or fat is said to be rancid, and the phenomenon is called as rancidity. Antioxidant like Vitamin E helps to prevent rancidity.

b) Explain the following terms: (1.5Mark each)

i) Egg white injury:

It's a deficiency disease of biotin which is rare and generally observed when large quantities of raw eggs are consumed. Egg white contains large amount of protein avidin which binds to biotin very tightly and prevents its absorption in the intestine. The avidin in egg white may be a defense mechanism inhibiting growth of bacteria. When eggs are cooked avidin gets denatured along with other egg white proteins.

ii) Hypervitaminosis:

Hypervitaminosis refers to a condition of abnormally high storage levels of vitamins, which can lead to toxic symptoms. The medical names of the different conditions are derived from the vitamin involved.

With few exceptions, like some vitamins from B complex, hypervitaminosis usually occurs more with fat-soluble vitamins which are stored in the liver and fatty tissues of the body. These vitamins build up and remain for a longer time in the body than water-soluble vitamins.

Eg. Hypervitaminosis A, Hypervitaminosis D, Hypervitaminosis E, Hypervitaminosis K,

c) Describe in brief role of vitamin A in vision

(Explanation 1.5 M, Diagram 1.5 M)

The retina of the eye contains two types of receptor cells, Rod cells which are responsible for dim light vision & the cones, responsible for bright light vision .Cones are also responsible for colour perception. The deficiency of cone pigments makes the individual colour blind.

In retinal pigments, the rod cells contain rhodopsin. Under the influence of light, rhodopsin is converted to lumirhodopsin which is further converted into metarhodopsin.

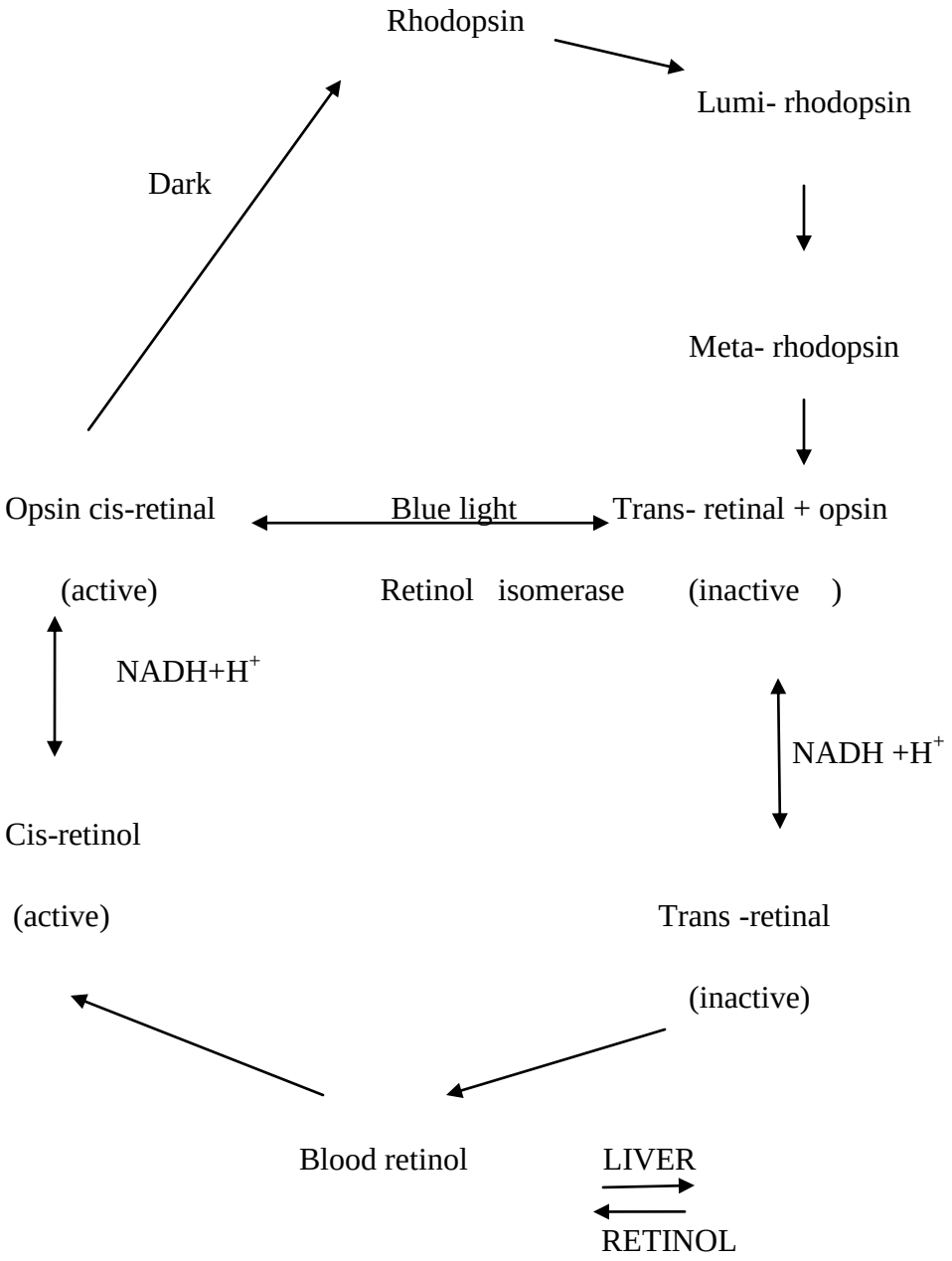
Then hydrolysed to protein opsin & trans retinal. Trans-Retinal(trans- retinene) is inactive in the synthesis of rhodopsin, it must be coverted to the active cis- isomer.

In the eye, the trans-retinal is reduced to trans-retinol by the enzyme retinal reductase & NADH.

The trans retinol which is too inactive in rhodopsin synthesis is passed into blood stream, then carried to liver .

It is then converted to cis -isomer. In dim light active cis-retinol from the blood enters the retina where it is oxidized to cis-retinal by reverse action of retinal reductase in the presence of NAD^+.

Finally the cis-retinal combines with protein opsin to give back rhodopsin and thus cycle is repeated.


Rhodopsin
Lumi- rhodopsin
Dark
Meta- rhodopsin
Opsin cis-retinal
Blue light
Trans- retinal + opsin
(active)
Retinol isomerase
(inactive)
NADH+H+
NADH +H+
Cis-retinol
(active)
Trans -retinal
(inactive)
Blood retinol
LIVER
RETINOL

d) Define and classify lipids.(1+2 Mark)

The lipids are a large and diverse group of naturally occurring organic compounds that are related by their solubility in nonpolar organic solvents (e.g. ether, chloroform, acetone & benzene) and general insolubility in water. They are esters of fatty acids.

Classification:

Simple lipids:

Esters of fatty acids with alcohol.

- Fats & oils : Castor oil
- Waxes : Bees wax

Compound Lipid

- Glycerophospholipids., Sphingophospholipids, Glycolipids:.
- Lipoprotiens: Contain protiens
- Sulpholipids
- Aminolipids
- Lipoprotiens: Contain protiens
- Sulpholipids:
- Aminolipids:

Derived Lipids:

- Eg: Alcohols, Glycerol, Fatty acids etc

Miscellaneous Lipids:

- Eg : Carotenoids, Squalene.

Neutral Lipids:

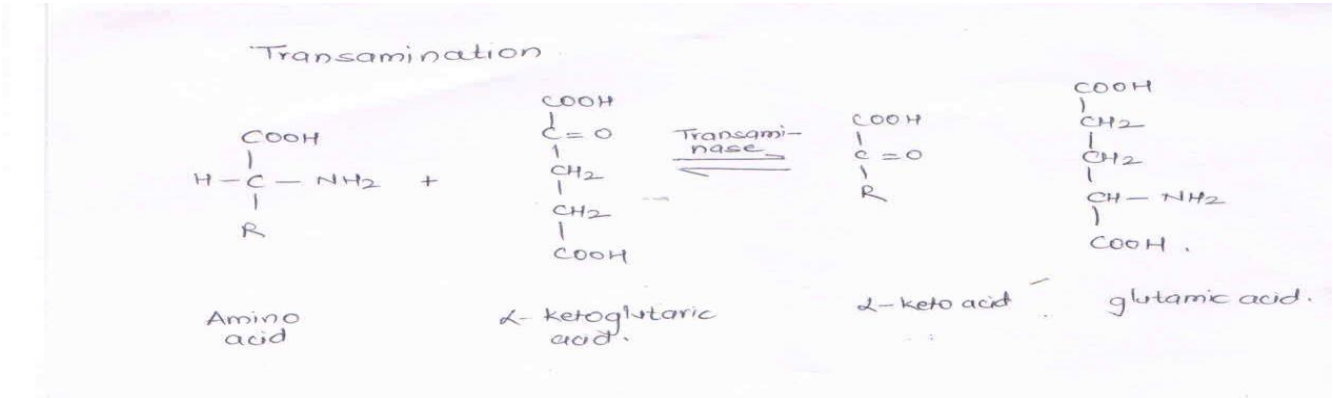
- They are mono, di, triacyl glycerols, cholesterol, cholesteryl esters.

Schematic classification can be considered.

e) Write in brief about : (1.5Mark each)

i) Transamination

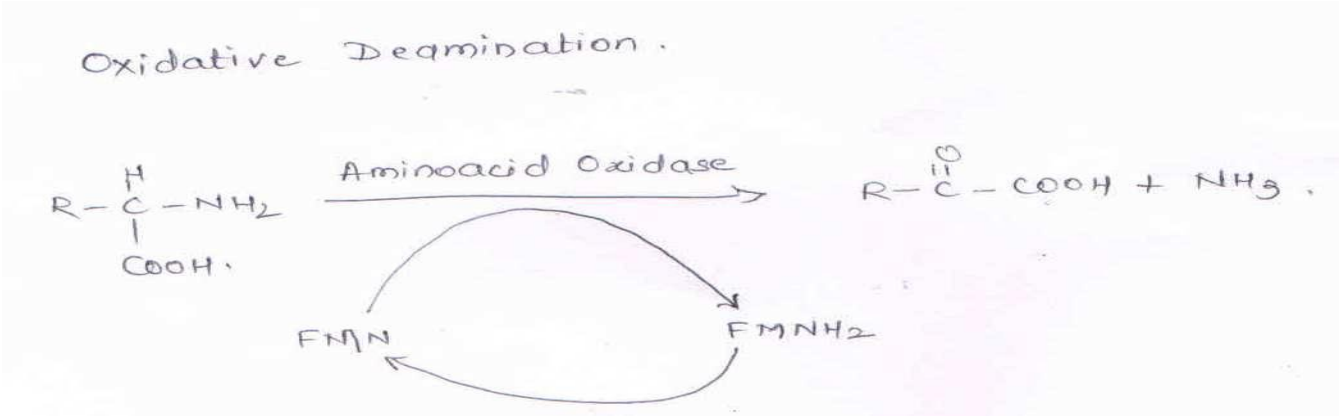
In transamination, the NH_2 group on one molecule is exchanged with theC =O group on the other molecule. The amino acid becomes a keto acid, and the keto acid becomes an amino acid



In this example alpha keto glutaric acid becomes glutamic acid, amino acid becomes keto acid.

This reaction is reversible.

ii) Oxidative deamination: An amino acid is converted into the corresponding keto acid by the removal of the amine functional group as ammonia and the amine functional group is replaced by the ketone group. The ammonia eventually goes into the urea cycle. The main sites for this reaction are liver and kidney. The reaction is catalysed by amino acid oxidase enzymes.
Reaction:



f) Give pharmaceutical and therapeutic significance of enzymes.

Pharmaceutical Significance of enzymes (Any 3 can be considered for 1.5 M)

- Rennin is used for cheese preparation
- Glucose isomerase is used for production of syrup
- Alpha amylase is used in food industry to covert starch to glucose
- Penicillin acylase is used for production of 6- amino pencilanic acid
- Papain, pepsin and trypsin are used in preparation of digestants

Therapeutic Significance of enzymes (Any 3 can be considered for 1.5 M)

- Trypsin: Purified enzyme is used orally or parenterally or intramuscularly in treatment of acute thrombophlebitis
- Streptokinase: Bacterial enzyme causes fibrinolysis & dissolution of clot.
- Pepsin is used in treatment of gastric achylia
- Lysoenzyme useful in treatment of eye infection
- Galactosidase useful in treatment of lactose intolerance.
- Sulphanilamide because of its similarity with PABA competes with it & inhibits enzyme folic acid synthatase & selectively kills pathogenic organisms.
- Allopurinol acts as competitive inhibitor of xanthin &reduces its conversion to uric acid .So it is useful in treatment of gout.

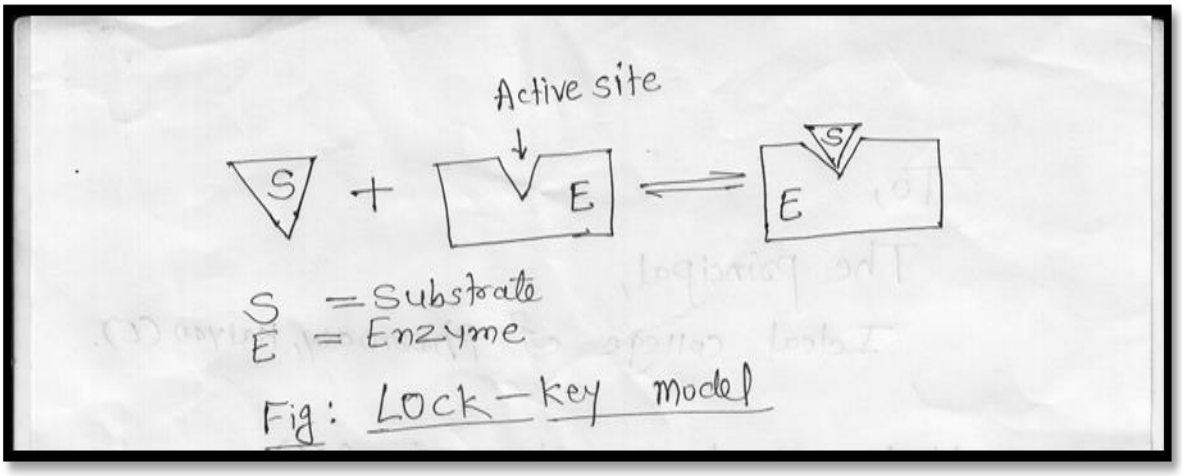
Other correct related examples can be considered

Q.4 Solve any FOUR of the following

a) Explain enzyme binding of a substance with the help of suitable models.(1.5 Mark For each model)

Active site of an enzyme: It is a region or area of an enzyme on which the substrate binds.

Lock & Key model:



It is the first model proposed by" Emil Fisher" to explain enzyme action mechanism.

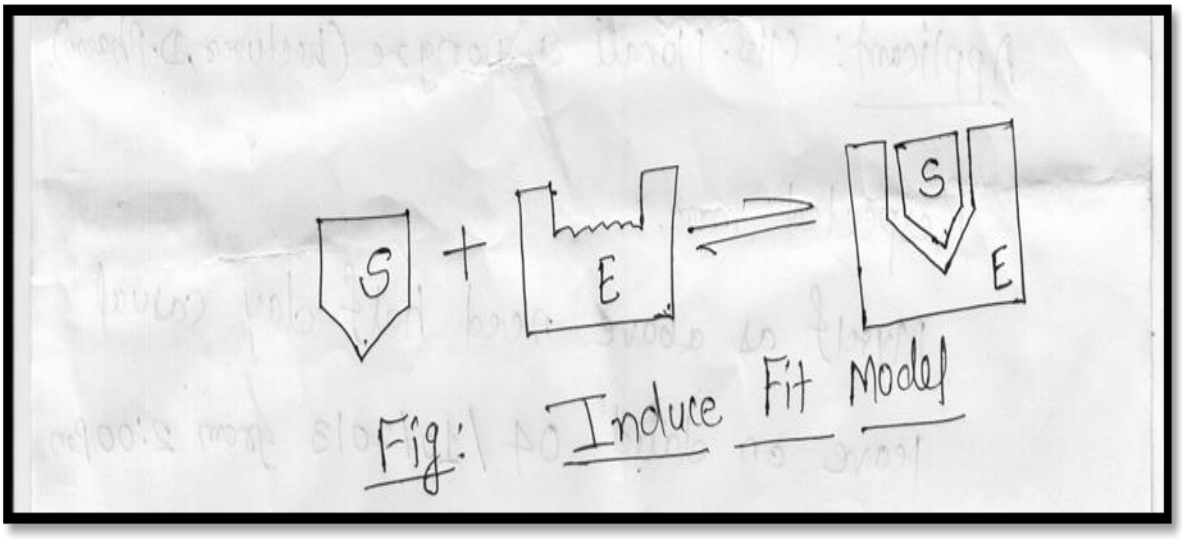
It is like a Lock & Key.

In this case the shape of active site of an enzyme and that of substrate is complementary to each other.

The substrate molecule fits into the active site of enzyme just as key fits into a lock. Hence called Lock & Key model.

The shape of active site is rigid and complementary to the shape of substrate complex.

Induced fit model:



In this case the shape of active site of an enzyme is flexible so as to accommodate wide variety of substrate molecules.

The shape of active site of enzyme is made complementary to the substrate molecule.

b) What are lymphocytes? Explain their role in health and disease.(1.5 Mark each)

Lymphocyte: Lymphocytes are among agranulocytes (leucocytes/ WBCs). These have spherical nucleus and are nonphagocytic.

Types: B –cells: These possess the capability to specifically recognize each antigen & produce antibodies (immunoglobulins) against it.

T-cells: These can identify viruses and microorganisms from the antigens .They are responsible for cell- mediated immunity.

Role in Health and diseases**:**

- These produce antitoxins and antibodies
- They help in healing of wounds.
- Increase in number of lymphocytes in blood (lymphocytosis) is observed in viral infection like Hepatitis A, Bordetella pertusis.

c) Explain water balance of the adult healthy individual. :(Explanation 1 marks, table 2Marks)

(Balance may be given for 2500ml/2800ml)

Water is very essential for living system. There is no life without water. Total body water accounts for 70%of body weight. However a loss of 10% of water in our body is serious and a loss of 20% is fatal.

Therefore a balance should be maintained between water intake and output.

Water intake source -

1) Drinking water -1500ml

2) Solid food -1000ml

3) Oxidation of carbohydrates , fats and protein- 300ml

Water loss from body -

Water is lost continuously from the body in the following ways.

1) via kidney as urine -1500ml

2) via skin -800ml

3) via lungs in expired air -400ml

4)via feces- 100ml

Balance Sheet-water intake and water loss.

Water intake	Ml	Water loss	Ml
Drinking water	1500ml	Urine	1500ml
Solid food	1000ml	Feces	100ml
Oxidation of carbohydrates,	300ml	Skin	800ml
Fats, Proteins		lungs	400ml
Total	2800ml		2800ml

d) Write biochemical role and deficiency symptoms of: (Role 1 Mark, deficiency symptoms 0.5 Mark for each)

i) Calcium:

Plays important role in:

Formation & development of bones &teeth

Muscle contraction

Blood clotting

Growth of children

Responsible for transmission of nerve impulse

Activation of enzymes

Regulation of permeability of membranes.

Deficiency symptoms:

Painful muscle cramps, loss of muscle tone, Flabby face, hands & feet affected, spasms, Faulty calcification of bones, Diffuse bone pain, Muscle weakness,Skeletal deformity ,Reduction in total bone calcium (Demineralization)

ii) Zinc:

Plays important role in

Vitamin A metabolism

Healing of wounds

Enzyme catalyzed reactions as cofactor

Deficiency:

Hepatic porphyria

Proteinuria

Delayed wound healing

Retarded genital development in men.

e) Explain in brief the following terms: (1.5 marks each)

i) Kwashiorkor

It is predominantly found in children between 1-5 yrs.

It is due to insufficient intake of proteins as the diet of a weaning child consists of carbohydrate

Symptoms:

Stunted growth, Edema on legs & hands, Diarrhea , Discoloration of hair skin, Anemia , Apathy, Moon face, Decreased plasma albumin concentration

Treatment

Protein rich food

ii) Marasmus

Occurs in children below 1 yr age.

Symptoms:

Growth retardation, Muscle wasting, Anaemia, Weakness, No edema, No decreased concentration of plasma albumin

Treatment:

Mother's milk

f) Give the functions of Vit. C (Any 6 functions for 3 marks)

Vitamin C plays important role in:

- Collagen formation
- Bone formation
- Iron & haemoglobin metabolism
- Tryptophan,Tyrosine, & Folic acid metabolism
- Synthesis of immunoglobulins (antibodies)
- Synthesis of peptide hormone & corticosteroid hormones
- Reduces risk of cataract formation
- As an antioxidant reduces risk of cancer, coronary heart disease.

Q.5 Solve any four of the following

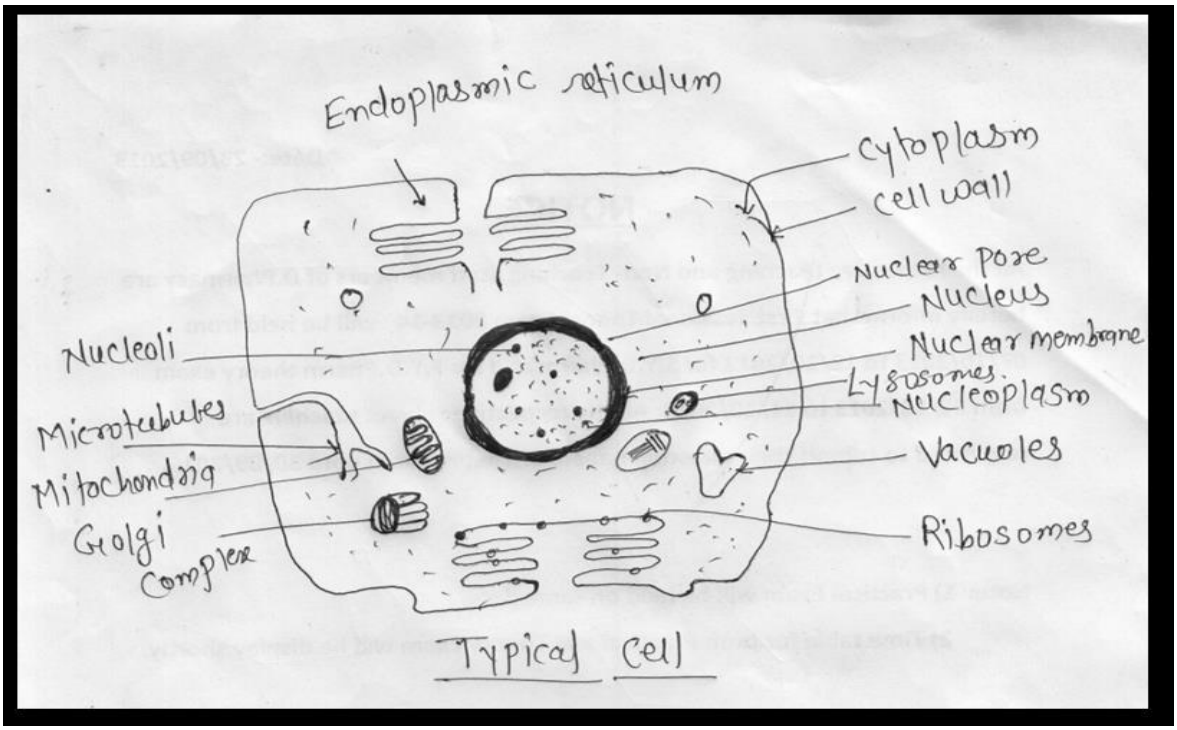
a) What is anaemia? Write in brief about sickle cell anaemia.(Definition 1M, 2 M explanation)

Anaemia

Decrease in oxygen carrying capacity of blood can be called as anaemia. It depends on haemoglobin content of erythrocytes .Reduction in blood haemoglobin level & number of circulating erythrocytes indicates anaemia

Sickle cell anaemia: It is genetic disorder. Bone marrow produces abnormal type of cells. The shape of large number of red cells is like sickle cell or crescentric and the life span is completely shortened. Patients with sickle cell show marked susceptibility to infection and there is blockage of blood supply to vital organs as sickle cells don't pass through small blood capillaries. These patients should avoid places with low oxygen supply.

b) Draw a neat and well labelled diagram of typical animal cell. (3M)



c) What are electrolytes (1M)? Write functions of electrolytes in our body (2 M)

Electrolyte is a substance that ionizes when dissolved in suitable ionizing solvents such as water. Electrolytes affect the amount of water in your body.

Common electrolytes include: Calcium, Chloride, Magnesium, Phosphorous, Potassium, Sodium Electrolytes can be acids, bases, and salts.

Functions of electrolytes:

• Many of them are essential minerals e.g. sodium, potassium etc. They perform important role in our body.

• Minerals maintain acid base balance, required for normal cellular activities.

• Electrolytes control osmosis & hence volume of various body fluids.

• They carry electrical current that allows production of action potential & gradient potential required for nerve impulse transmission

d) Enlist various factors affecting rate of enzyme catalysed reaction(1.5M) Explain in detail role of temprature.(1.5M)

Factors that affect velocity of enzyme catalyzed reaction

• Hydrogen ion concentration

• Concentration of enzymes

• Concentration of substrate

• Temperature

• Time

• Products of reaction

• Effect of light & other physical factors

• Allosteric factors

• Effect of hormones & other biochemical agents

Effect of temperature:

• Optimum temperature is usually reached at around 37°C—45°C for animal enzymes.

• Velocity of reaction is increased from 1.1 to 3 times for every 10° rise in temperature.

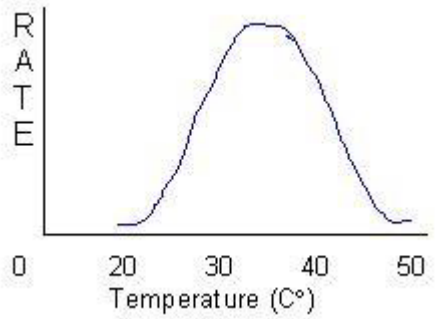
• Above the optimum temperature, rate decreases.

• The enzyme gets denatured at a rate faster than the increase in reaction.

• Most of the enzymes get denatured above 60°C.

• The time of exposure is also important factor. An enzyme may withstand higher temperatures for short periods of time.

• Optimum temperature has meaning only if the time of reaction is also stipulated. Enzyme activity is maximum at optimum temperature.



e) Define: (Any three definitions -1mark each)

i). **Exoenzyme**: The enzymes which are secreted outside the cell are known as exoenzymes.

ii) **Endoenzyme:** The enzymes which are present inside the cell are called endoenzymes.

iii) **Induced enzyme**: The enzymes which are present in trace amounts but their concentration gets increased in the presence of substrate hence are known as induced enzymes.

iv) **Zymogens:**

Produced naturally in an inactive form which can be activated when required. Enzymes like pepsin are created in the form of pepsinogen, an inactive zymogen. Pepsinogen is activated when Chief cells release it into HCl which partially activates it.

f)Give functions of folic acid.(Any 3)

- Folic acid is used in the treatment of anaemia due to folic acid deficiency.
- Tetrahydrofolate, coenzyme of folic acid is involved in one carbon group transfer reactions.
- It is involved in biosynthesis of nucleic acid.
- It is involved in synthesis of amino acids like methionine, serine
- It is essential for growing & multiplying cells.
- Folic acid is required for synthesis of RBC in bone marrow

Q.6 Solve any four of the following:

a) What is ATP (2M)? What is its role in biological system.(2M)

The exchange of metabolic energy is carried through a common intermediate called as ATP(Adenosine tri phosphate). ATP is present in all living cells & it has strong tendency to get hydrolysed to ADP and phosphate, during this energy is liberated and made available for biological activites.

Role

- ATP functions as a carrier of energy, as all biological activites which require energy are ATP dependent. This energy is given to various cellular processes in chemical form.

  ATP ------ ADP + Pi + Energy
- ATP transports chemical energy within cells for metabolism
- ATP is used by enzymes and structural proteins in many cellular processes, including biosynthetic reactions, motility, and cell division
- ATP is used as a substrate in signal transduction

b) Explain the following terms (2M each)

i) Ketosis

Normally acetyl CoA formed from pyruvate, beta oxidation & amino acids gets condensed with oxaloacetate & oxidised to carbon dioxide & water.

During impaired carbohydrate metabolism or low carbohydrate intake, fate of acetyl CoA changes if oxaloacetate is available in limited supply or large quantity of fatty acid is oxidised to Acetyl CoA Excess acetyl CoA is diverted for production of ketone bodies & the process is called as Ketosis.

Acetone, Aceto acetic acid and Beta hydroxybutyric acid are ketone bodies.

ii) Pellegra

It is a vitamin deficiency disease caused by dietary lack of niacin
The symptoms of pellagra include:

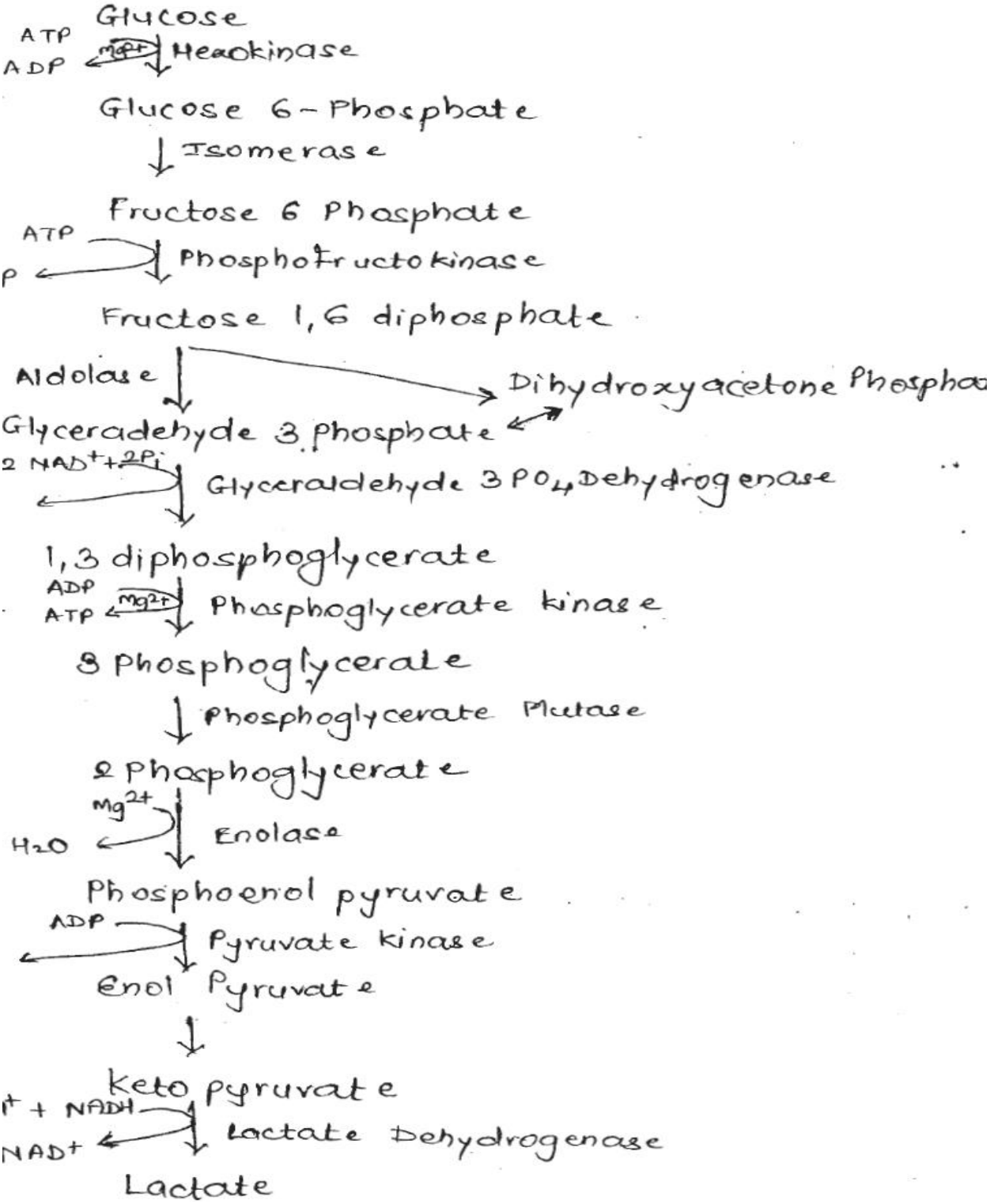
• Dermatitis, oedema , skin lesions

• Dementia

• Diarrhoea

The main results of pellagra can easily be remembered as "the three D's": diarrhea, dermatitis and dementia.
Pellagra can be treated with niacin (usually as niacinamide). The frequency and amount of niacinamide administered depends on the degree to which the condition has progressed.

c) Explain in brief reactions of Glycolysis
(Schematic presentation or explanation can be considered for 4 marks)



Glycolysis:It's a main pathway for glucose oxidation

1. Phosphorylation of glucose to glucose 6 phospate in presece ofenzyme hexokinase & ATP & Mg

2. Isomerisation of Glucose 6 phosphate to fructose 6 phosphate in presence of phosphohexo isomerase

3. Phosphorylation of fructose 6 phosphate to fructose 1,6 diphosphate in presence of phosphofructokinase,ATP & Mg

4. Cleavage of fructose 1,6 diphosphate to dihydroxy acetone phosphate & glyceraldehyde 3 phosphate in presence of aldolase. These 2 products are interconvertible in presence of triose phosphate isomerase

5. Glyceraldehyde 3 phosphate further undergoes oxidation to 1,3 diphosphoglycerate in presence of

glyceraldehyde 3 phosphate dehydrogenase & NAD+

6. Transformation of 1,3 diphosphoglycerate to 3- phosphoglycerate in presence of phosphoglycerate kinase, Mg & ADP

7. 3- phosphoglycerate changes to 2-phosphoglycerate in presence of phosphoglycerate mutase

8. Loss of water molecule from 2-phosphoglycerate results into formation of phosphoenol pyruvic acid in presence of enolase

9. Loss of phosphate from phosphoenol pyruvic acid results into formation of Enol pyruvic acid in presence of pyruvate kinase, Mg & ADP

10. Enol pyruvic acid gets converted to keto form of pyruvic acid in presence of pyruvate kinase

11. Keto pyruvic acid under aerobic conditions enter TCA cycle in mitochondria. Pyruvic acid forms main end product of glycolysis in those tissues which are supplied with sufficient Oxygen

12. But tissues where oxygen is not supplied ,lactic acid is formed as an end product of glycolysis by reduction in presence of lactate dehydrogenase & NADH

Net reaction for glycolysis is:
Glucose + 2NAD+ + 2 ADP + 2 Pi → 2 Pyruvate + 2 ATP + 2 NADH + 2 H2O

d)What is Dehydration?(1M) Give its symptoms and treatment(2M). Write role of ORS (1M).

It is a condition characterized by water depletion in the body

It may be due to loss of water alone or due to deprivation of water & electrolytes.

Causes

Diarrhea, vomiting, Excessive sweating , Fluid loss in burns, Adrenocortical dysfunction, Kidney diseases, Cholera

Symptoms.

Increased pulse rate, low blood pressure, sunken eyeballs, decreased skin elasticity, lethargy, confusion & ultimately coma.

Treatment:

Intake of plenty of water

If a person can't take orally water be given I.V.ly in an isotonic solution (5%glucose)

If dehydration is due to loss of electrolytes, then electrolytes can be given orally or intravenously.

ORS (Oral Rehydration Solution / Salts) is a type of fluid replacement used to prevent or treat dehydration especially that is due to diarrhea. The therapy involves drinking water with modest amounts of sugar and salt added. Mild to moderate dehydration in children is best treated with ORT. Persons taking ORT should eat within 6 hours and return to their full diet within 24–48 hours

Oral rehydration therapy is commonly used to treat cholera & other diarrheal diseases.

e) Explain in brief reactions of urea cycle.

(4 M schematic presentation or explanation can be considered)

1)Molecule of ammonia, CO2 & phosphate are condensed to form 'Carbamoyl phosphate' in presence of enzyme 'carbamoyl-phosphate synthetase.

2) Carbamoyl phosphate transferred to ornithine forms citrulline in presence of an enzyme ornithine transcarbamoylase. This reaction takes place in mitochondria. The citruline formed in this reaction enters in cytoplasm & the next reactions take place in cytoplasm

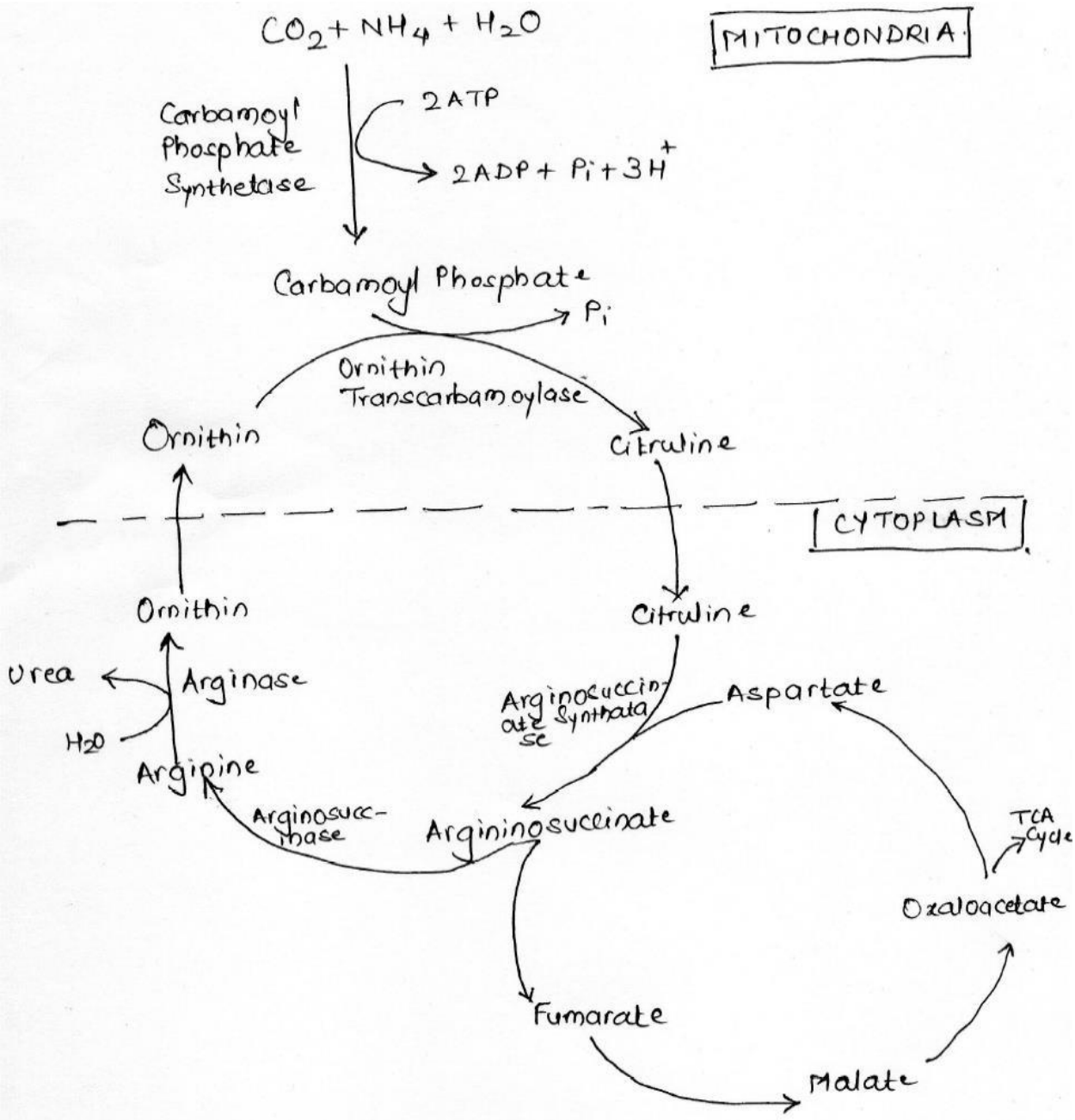
3) Citrulline condenses with Aspartate to form argininosuccinate. The reaction is catalysed by an enzyme Arginosuccinate synthetase.

4) Arginosuccinate is now cleaved into 'arginine' & 'fumarate' by the enzyme 'arginosuccinase'. Fumarate formed may be converted to oxaloacetate via the actions of enzymes 'fumerase'& malate dehydrogenase & then transmitted to regenerate aspartate.

5) Finally arginine is cleaved into ornithine & urea by the enzyme arginase. With this reaction cycle is completed & ornithine molecule accepts molecule of carbamoyl phosphate to repeat the cycle.

the overall equation of the urea cycle is:

$NH_3 + CO_2 + \text{aspartate} + 3\ ATP + 2\ H_2O \rightarrow \text{urea} + \text{fumarate} + 2\ ADP + 2\ Pi + AMP + PPi$


$CO_2 + NH_4 + H_2O$
MITOCHONDRIA
Carbamoyl Phosphate Synthetase
2ATP
2ADP + Pi + 3H+
Carbamoyl Phosphate
Pi
Ornithin Transcarbamoylase
Ornithin
Citrulline
CYTOPLASM
Ornithin
Citrulline
Urea
Arginase
H2O
Arginine
Argininosuccinate Synthetase
Aspartate
Arginosuccinase
Argininosuccinate
TCA Cycle
Oxaloacetate
Fumarate
Malate

f) What are Enzymes? How they are classified on the basis of type of reactions catalyzed by them. : (Definition 1 mark, Classification 2 marks, Examples 1mark)

Highly specific proteinous substances that are synthesized in a living cell & catalyze or speed up the thermodynamically possible reactions necessary for their existence.

Classification of Enzymes on the basis of reactions they catalyze:

- Oxidoreductases :

They bring about biological oxidation & reduction between two substrates.
e.g ; Dehydrogenases, Oxidases, Hydroperoxidases, Oxygenases, Hydroxylases

- Transferases :

Catalyse transfer of some group or radical from one molecule to another.
E.g.Transaminases, Transphosphorylases, Transglycosidases

- Hydrolases:

Bring about hydrolysis or condensation of substrate by addition or removal of water.
Eg. Esterases, Peptidases

- **Lysases:**

Catalyse removal of groups from larger substrates by mechanisms other than hydrolysis, leaving double bonds.
e.g. Carboxylysases, Aldehydelysases

- **Isomerases:**

Catalyze interconversion of isomers. eg. Dextrose isomerase

- **Ligases/ Synthatases**:

Catalyse the linking or synthesizing together of 2 compounds.Forming C-S bonds, C-N bonds, C-C bonds. E.g: Lysases, Isomerases, Ligases / Synthatases