



**WINTER-15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 1/ 41

**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.

WINTER -15 EXAMINATION

Subject Code: 0808

Model Answer

Page No: 2 /41

1. Attempt any eight of the following:

a) Define biochemistry and state its significance in pharmacy ( 1 mark definition,1 mark significance any two )

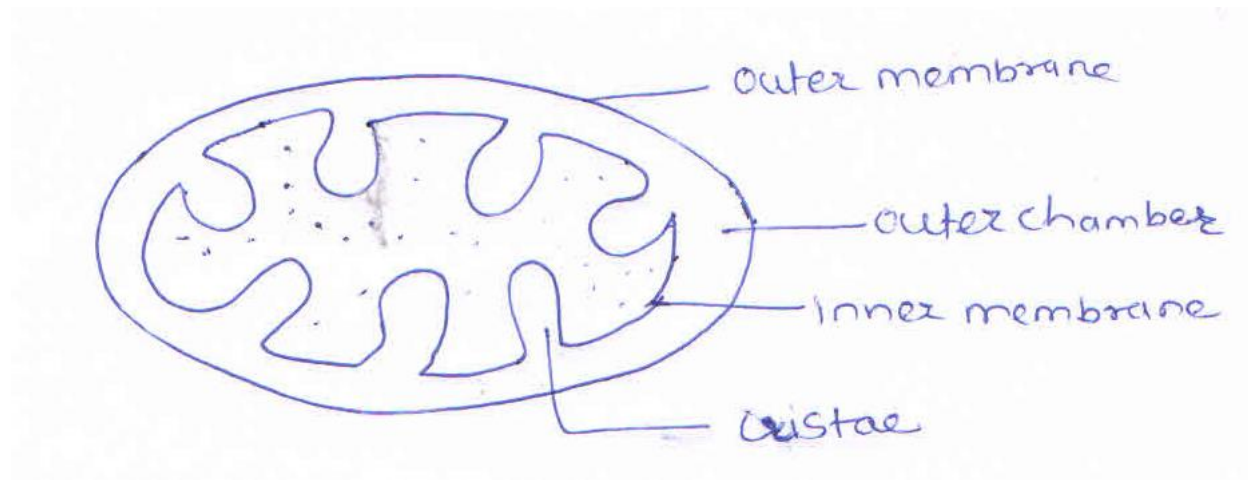
Biochemistry -The study dealing with the chemistry of living organism in its different phases of activity is called as biochemistry.

Significance:

- 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.

b) A Draw a neat labelled diagram of mitochondria and describe its functions

( 1 mark diagram,1 mark functions any two )



WINTER -15 EXAMINATION

Subject Code: 0808

Model Answer

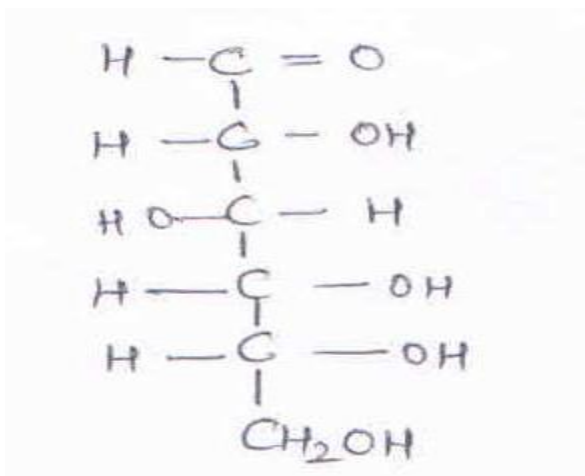
Page No: 3/ 41

**Functions:**

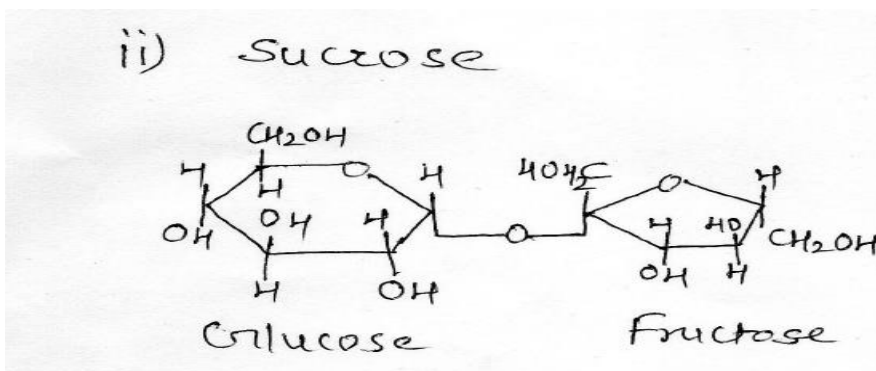
- Mitochondria are engaged in oxidative metabolism,
- These are responsible for the transportation of chemical energy into biological energy, in the form of ATP compounds.
- All enzymes involved in Kreb's cycle are present in mitochondria.

c) Give the structures of (1 M each)

i) D- Glucose



ii) Sucrose





---

**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 4/ 41

**d) What are essential amino acids? Enlist any four of them.( 1mark definition,1 mark e.g. )**

Essential amino acids: Amino acids which cannot be synthesized by the body but which are required for normal functioning of body and supplied through diet.

Eg. Valine, leucine, Isoleucine, phenylalanine, tryptophan, lysine, arginine, histidine, methionine. (any 4 )

**e) Explain 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.

**f) Write following tests of carbohydrates. (1 mark each)**

i) Benedict's test:

Principle: Carbohydrate is heated with alkaline copper sulphate, copper ions get reduced and give red precipitate of cuprous oxide. All reducing sugars give this test positive, while sugars like sucrose does not give this test positive.

**OR**

Procedure :Sugar solution + Benedicts reagent – Red ppt indicates presence of reducing sugars



**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 5/ 41

**ii) Molisch's test**

Step I : Formation of furfural compound

STEP II: Furfural compound reacts with alpha naphthol present in molish reagent to give violet ring at junction of two liquids and Conc H<sub>2</sub>SO<sub>4</sub> acts as a dehydrating agent.

**OR**

Molisch test: - Sugar solution + Molisch reagent + Conc H<sub>2</sub>SO<sub>4</sub> from the side of test tube – gives Violet ring at the junction of two liquids.(1 mark)

Either Principle or Procedure Can be considered

**g) What is anaemia . Describe sickle cell anaemia. (1 mark each)**

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.



**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 6/ 41

**h) Explain the following (1 mark each)**

**i) Metabolism:** All biochemical changes that occur in biological system are grouped together as metabolism./ Metabolism is the set of chemical reactions(Anabolic & Catabolic) that occurs in living organisms to maintain life

**ii) Pathological urine**

Urine that contains substances essential to the body or tissues (like sugar, bile salts, albumin etc.), in addition to normal organic & inorganic substances, is called as pathological

**i) Enlist the fat soluble vitamins :( 2 marks)**

**Vitamin A**

**Vitamin D**

**Vitamin E**

**Vitamin K**



WINTER -15 EXAMINATION

Subject Code: 0808

Model Answer

Page No: 7/ 41

**j) Distinguish between fats and oils.(any four)**

**Fats**

Esters of fatty acid with glycerol.

Acts as food reservoir

Oxidized by atmospheric oxidation

Fats are solids at room temp

e. g. bees wax.

**Oils**

Esters of fatty acid with higher alcohol

Mostly protective in functions

Resistant to atmospheric oxidation

These are liquid at room temp

e. g. castor oil

**k) What are minerals? Give their biochemical functions. ( 1 mark definition, 1mark functions )**

**MINERALS:**

These are inorganic homogeneous substances which must be supplied by the diet to perform various physiological functions.

Major minerals: Calcium, magnesium, sodium, potassium, phosphorus, sulphur, chlorine.

Trace minerals: Iron, Iodine, zinc, copper, Manganese, cobalt, selenium.



**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 8 / 41

**Biochemical functions (Any Four)**

Maintenance of acid base balance

- Maintenance of electrolyte balance
- Maintenance of osmotic pressure of cell
- Growth & maintenance of tissues & bones
- Proper working of nervous system
- Muscle contractions
- Transport of oxygen
- Activation of enzymes

**1) What is meant by marker enzymes? ( 1 mark for definition and 1 m for example))**

The enzyme whose presence or decrease or increase in level of blood, CSF or urine indicates the presence of disease or disorder is known as marker enzymes.

Marker enzymes	Diagnostic use
Lactate dehydrogenase	myocardial infarction
Aspartate aminotransferase	Hepatitis





---

**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 9/41

**Q.2 Attempt any four of following**

**a) Define Carbohydrates and classify them with examples.**

**( 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



---

**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 10/ 41

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

**b) Write biological functions of proteins ( ½ mark for each any 6)**

1] Some proteins 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] Nucleoproteins act as carrier of genetic characters.

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

8] They function in the haemostatic control of the volume of circulating blood and that of interstitial fluids through the plasma proteins



---

**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 11/41

**c) What are compound lipids? Give their classification with examples.( 1 mark each )**

Compound Lipid- These are esters of fatty acids containing groups in addition to alcohol and a fatty acid.

**a)Phospholipid**

Glycerophospholipids(Lecithin, Cephalin), Sphingophospholipids(sphingomylin)

**b) Glycolipid**

Cerebrosides and Gangliosides

**c) Lipoproteins.**

Galactocerebrosides

**d) Explain following terms: ( 1.5 mark each )**

**i) Lecithines –**

These are also called as phosphatidyl choline.

These on hydrolysis yield glycerol, fatty acid, phosphoric acid and choline.

These are present in various oily seeds like soyabean and yeast .

In animals glandular and nervous tissues are rich in these lipids

These are white substances but becomes brown when exposed to air

These are soluble in ordinary fat solvents except acetone.



WINTER -15 EXAMINATION

Subject Code: 0808

Model Answer

Page No: 12/ 41

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 help to prevent rancidity.

e) **Mention the names of water soluble vitamins and their respective coenzymes.( name 1 ½ mark, coenzymes 1 ½ mark)**

Water soluble vitamins

Coenzymes

➤ Non B- complex:Vitamin C (Ascorbic acid)      Ascorbic acid

➤ B complex

a) Vitamin B1- Thiamine

Thiamine pyrophosphate

b) Vitamin B2- Riboflavin

FAM ( Flavin mono dinucleotide),

FAD (Flavin adenine dinucleotide)

c) Vitamin B3- Niacin

NAD( nicotinamide adenine dinucleotide),

NADP( nicotinamide adenine dinucleotide phosphate ),

d) Vitamin B5- Pantothenic acid

Coenzyme-A

e) Vitamin B6- Pyridoxine

Pyridoxal phosphate



**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 13/ 41

- |                                |                          |
|--------------------------------|--------------------------|
| f) Vitamin B7- Biotin          | Biotin                   |
| g) Vitamin B9- Folic acid      | Tetrahydrofolate         |
| h) Vitamin B12- Cyanocobalamin | Deoxyadenosine cobalamin |

**f) How will you identify following constituents in the given sample of urine. (1 mark each)**

**i) Ketone bodies :**

Rothera,s test : 5 ml urine sample +( NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> to saturate it completely + 2 drops of sodium nitroprusside solution + 2ml strong ammonia solution from side of test tube wait for 10 min .permanganate color develops, ketones like acetone present

**ii)Proteins (any 1 for 1 mark )**

- a) Sulphosalicylic acid test -3 ml urine+ Sulphosalicylic acid drop by drop, white ppt appears indicate albumin present.
- b) Hellers nitric acid test- 3 ml conc.HNO<sub>3</sub> + Add from side of test tube dropwise urine, white ring at the junction of two fluids indicate albumin confirmed.
- c) Heat coagulation test- 3ml urine + 2 drops of chlorophenol red, adjust the pH faint pink color by adding 1% Na<sub>2</sub>CO<sub>3</sub> boil for two minutes, turbidity appears indicate albumin confirmed.

**iii) Blood:**

Benzidine test: Pinch of benzidine powder +1ml of glacial acetic acid, shake for 1 minute. Add

2ml urine + few drops of H<sub>2</sub>O<sub>2</sub>, Green / blue colour due to iron benzidine formation indicates presence of blood.



WINTER -15 EXAMINATION

Subject Code: 0808

Model Answer

Page No: 14/41

3. Attempt any four of the following

12

a) Explain the following (1.5 m each)

- i. **Phenylketouria:** This is a genetic disorder related to phenylalanine metabolism. Phenylalanine is precursor for biosynthesis of tyrosine. In the catabolism of phenyl alanine the first enzyme phenylalanine hydroxylase convert phenylalanine to tyrosine. The inherited deficiency of this enzyme results in accumulation of phenyl alanine, and is excreted as phenyl pyruvate. This condition is called phenyl ketouria.
- ii. **Alkaptonuria:** This is a metabolic disorder of phenyl alanine due to lack of enzyme homogentisate deoxygenase resulting into accumulation of homogentisate, which is excreted via urine. Homogentisate gets oxidized to corresponding quinone which polymerize to give black or brown pigment 'alkaptone' & this colours urine. In cartilage and connective tissues, homogentisate gets polymerized and results into arthritis.

b) What are enzyme & classify them with examples: (Defn 1 mark, Classification 2 marks)

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 site of action:*

**Exoenzymes / Extracellular enzymes:**

- Secreted outside the cell
- Decompose complex organic matter like proteins ,fats, cellulose .E.g.: proteoses, lipases.



---

**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 15/ 41

**Endoenzymes / Intracellular enzymes:**

- Present inside the cell
- E.g.: synthetases, phosphorylases

**]] Constitutive Enzymes:**

- Produced in absence of substrate. Eg.: Enzymes of glycolytic series.

**Induced Enzymes:**

- Produced in presence of substrate. Eg.: hepatic microsomal enzymes.

**Zymogens / Proenzymes:**

- 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.

**OR**

**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



**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 16/ 41

- **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. Carboxylsases, Aldehydelysases

**Isomerases:**

Catalyze interconversion of isomers. eg. Dextrose isomerase

**Ligases/ Synthetases:**

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

**c) Explain water balance in body.:( 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.





**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 17/ 41

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



---

**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No:18 / 41

**d) What is enzyme inhibition? Explain Competitive inhibition with example  
(Definition 1 mark, Explanation 2 marks)**

Compounds or agents which inactivate the enzymes, & thus adversely affect the rate of enzyme catalysed reaction are called as inhibitors & this process is known as enzyme inhibition.

**Competitive inhibition:**

In Competitive inhibition structure of inhibitor (I) closely resembles with that of the substrate (S). The inhibitor thus competes with the substrate to combine with an enzyme (E) forming the enzyme inhibitor complex (EI) rather than (ES) complex. The degree of inhibition depends upon the relative concentration of the substrate & the Inhibitor. Thus by increasing the substrate concentration & keeping the inhibitor concentration constant the amount of inhibition decreases & decrease in substrate concentration result in increased enzyme inhibition. In this type of inhibition, enzyme can either bind with substrate (ES) or inhibitor (EI) but not both.  $V_{max}$  is unchanged  $K_M$  is increased.

Example: Sulpha drugs given to bacteria compete with para-amino benzoic acid (PABA) and folic acid synthesis is inhibited.

**Consider any other correct example**

WINTER -15 EXAMINATION

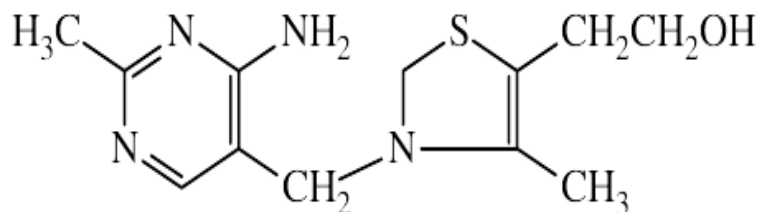
Subject Code: 0808

Model Answer

Page No: 19 / 41

e) Write the structure & functions of Vitamin B<sub>1</sub> (1 mark structure and 2 mark function)

Vitamin B<sub>1</sub>; Thiamine / Aneurine



THIAMINE

**Biochemical function**

- Thiamine (vitamin B<sub>1</sub>) helps the body cells convert [carbohydrates](#) into energy.
- It is also essential for the functioning of the heart, muscles, cardiovascular system and nervous system.

(f) Describe alpha – helical and beta – pleated structures of proteins.(1.0 M each for explanation& 0.5 M for each diagram)

The folding of the protein chain is mainly due to the presence of hydrogen bond between amino groups and carboxyl groups of the peptide bond, this is called as secondary structure of proteins.

Based on nature of hydrogen bonding there are two types:

- (i)  $\alpha$ - helix ( $\alpha$ - helical)
- (ii)  $\beta$ -pleated sheet



---

WINTER -15 EXAMINATION

Subject Code: 0808

Model Answer

Page No: 20/ 41

i)  $\alpha$ - helix ( $\alpha$ - helical)

the  $\alpha$  helical is the most common spiral structure of protein. It has a rigid arrangement of polypeptide chain. The  $\alpha$  - helical structure depends on the intramolecular hydrogen bonding between NH and C=O group of peptide bond ,in the  $\alpha$  - helix the polypeptide is folded in such a way that the C=O of each amino acid residue is hydrogen bonded to the NH of 4<sup>th</sup> amino acid residue along the chain.

(ii)  $\beta$ -pleated sheet: It is a another form of secondary structure, this results from hydrogen bonding between two peptide chains.

It may occur in two types

a) Parallel pleated sheet:

In this type of structure the polypeptide chain i.e. side by side and in the same direction so that N-terminal residues are on the same end. This pleated sheet confirmation is stabilized by hydrogen bonding, here bonds are formed between NH group of a peptide in one chain and C=O group of a neighbouring chain.

b) anti- parallel pleated sheet-

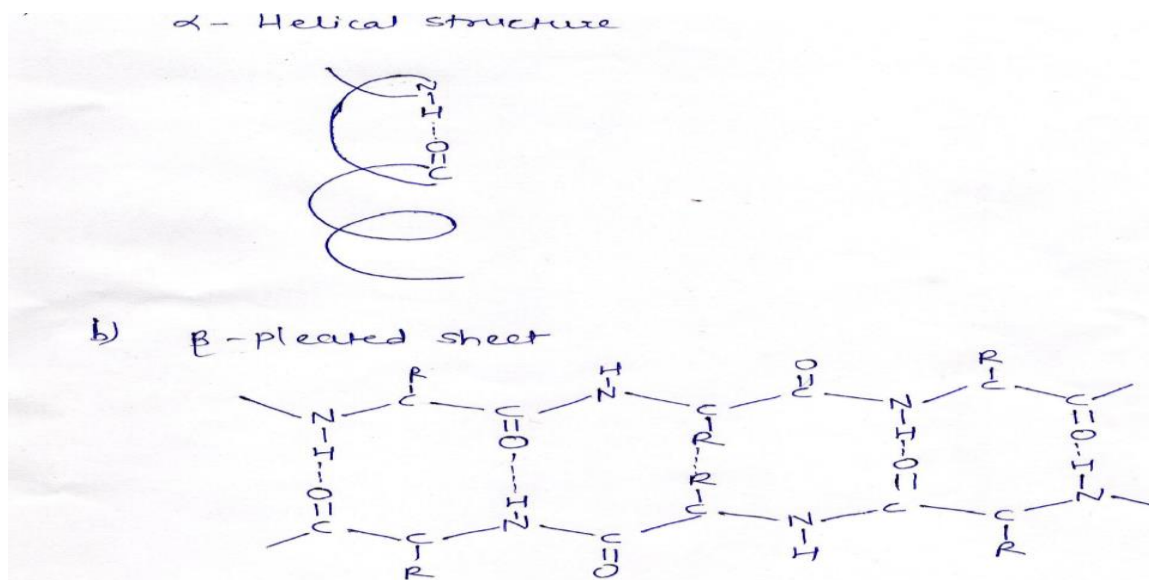
In this type of structure the polypeptide chain lie in opposite direction so that N-terminal end of one and C- terminal of the other, face each other. in this structure the polypeptide chains are held together by hydrogen bonds, so as to give a sheet like structure and hence are called as  $\beta$  – pleated sheet confirmation.

WINTER -15 EXAMINATION

Subject Code: 0808

Model Answer

Page No: 21 /41



4. Attempt any four of the following

12

a) Enlist the factors affecting rate of enzyme catalysed reaction. Explain effect of temperature (Enlist 1 m and 2 m for explanation)

Factors that affect velocity of enzyme catalysed 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

**WINTER -15 EXAMINATION**

Subject Code: **0808**

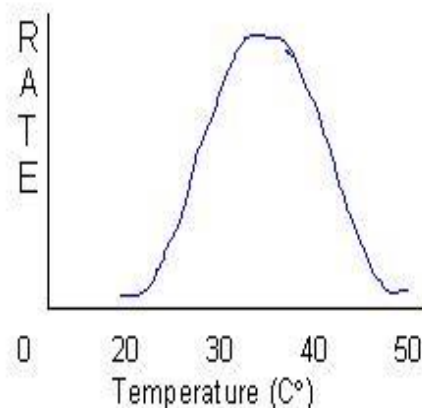
**Model Answer**

Page No: 22 /41

**Effect of temperature:(1.0 mark)**

- 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.

**Diagram (1 mark)**



**b) Define the following (1m each)**

**i. Jaundice**

a medical condition with yellowing of the skin or whites of the eyes, arising from excess of the pigment bilirubin and typically caused by obstruction of the bile duct, by liver disease, or by excessive breakdown of red blood cells.

**ii. Pyuria**

**Pyuria** is the condition of urine containing white blood cells or pus.

WINTER -15 EXAMINATION

Subject Code: 0808

Model Answer

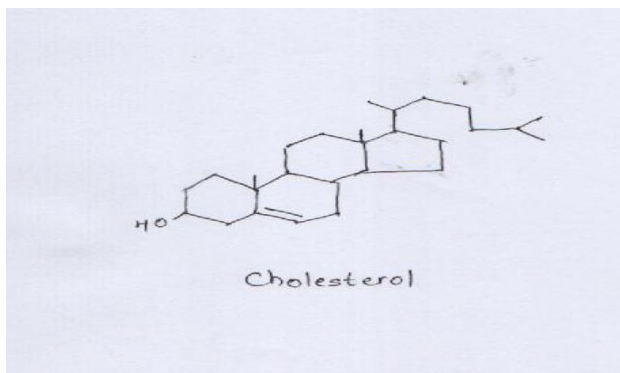
Page No: 23 / 41

**iii. Haematouria**

Hematuria- it is the appearance of blood in urine., may be due to T.B., cancer, renal stone.

**c) Give structure and two colour reaction of cholesterol**

(1 m for structure and 2 marks for any 2 tests)



➤ Liebermann-Burchard test:

When 2ml of chloroform solution of cholesterol is treated with 10 drops of acetic anhydride & 2 drops of concentrated sulphuric acid, deep red colour is formed, it rapidly changes to blue & finally to green colour

➤ Salkowski test:

When 2 ml of chloroform solution of cholesterol is treated with 2ml of concentrated sulphuric acid, after waiting for 3 mins layers separate. Chloroform layer turns red & acid layer shows greenish fluorescence

➤ Formaldehyde-H<sub>2</sub>SO<sub>4</sub> Test:

To a solution of cholesterol in chloroform in dry test tube If 2ml of formaldehyde-sulphuric acid solution is added, cherry colour develops.

WINTER -15 EXAMINATION

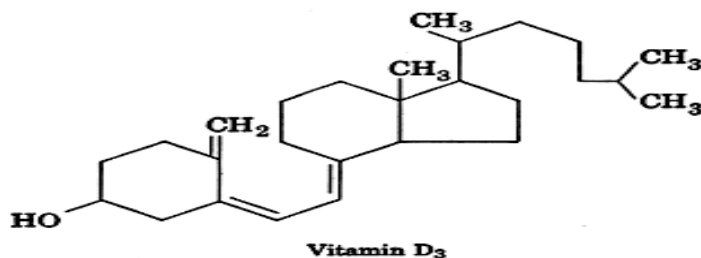
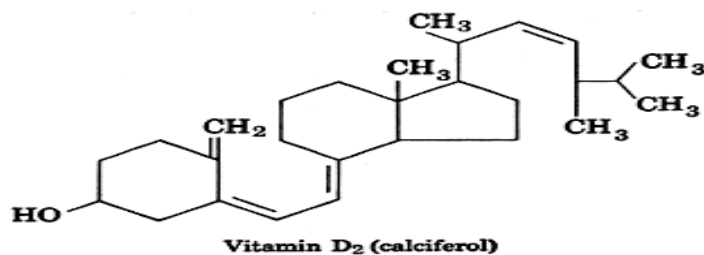
Subject Code: 0808

Model Answer

Page No: 24/ 41

d) Draw structure and give biological functions of Vitamin D

Structure (1mark Any one)



Biological Functions :(2 M)

- It increases intestinal absorption of calcium & phosphate
- It causes elevation in plasma calcium & phosphate levels.
- It helps in formation of bones
- It minimizes excretion of calcium & phosphate through kidneys.





**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 25 / 41

**e) What is Dehydration? Write the symptoms and treatment**

**Dehydration.(1Mark)**

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(1. mark)**

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

**Treatment: (1 mark)**

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.

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

**f) Explain the factors affecting rate of absorption of calcium in body. Give biochemical functions of calcium (Factors 2 M and for functions 1 M any two)**

Factors affecting calcium absorption: Any 4

1. Vitamin D - induces the synthesis of calbindin (carrier protein for Ca) in the intestinal epithelial cells, thus increasing Ca absorption.
2. Parathyroid hormone - it increases Ca transport across the membrane of intestinal cells.
- 3 Acidity - Ca is more soluble and absorbed in acidic medium.
4. Lactose - it favors calcium absorption in infants.



**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 26 / 41

5. Need for calcium efficiency of calcium absorption increases according to body demands. During pregnancy, lactation and adolescence calcium absorption efficiency increases by 50%.
6. Phosphate when present in high amount it causes precipitation of calcium in the form of calcium phosphate.  
Ideal ratio of Ca: P is 1:2 to 2:1.
7. Laxatives decrease the transit time for passage of food through intestinal tract. Thus reducing time for absorption.
8. Caffeine, drugs like anticoagulants, cortisone and thyroxine reduce calcium absorption.

**Functions**

- It is required for formation and development of bones and teeth
- It is required for blood coagulation process
- It is required for regulation of muscle contraction
- Deficiency of calcium causes tetany, rickets or osteoporosis



---

**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 27/ 41

**Q.5 Attempt any four of the following**

**a) Explain the following terms : (1.5 M each )**

**i) Allosteric enzyme**

The enzymes whose catalytic activity is regulated by itself are called allosteric enzymes. These are also called as regulatory enzymes, e.g. phosphofructokinase is an allosteric enzyme which converts fructose-6-phosphate to fructose-1,6-diphosphates.

**ii) Purpura**

It's a condition of platelet / thrombocyte count less than normal. Or there are red or purple discolorations on the skin that do not blanch on applying pressure. They are caused by bleeding underneath the skin & mucous membrane. Bleeding time is prolonged.

**b) Explain the role of vitamin in vision**

**( Explanation 2 M, Diagram 1 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 covered 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 .

WINTER -15 EXAMINATION

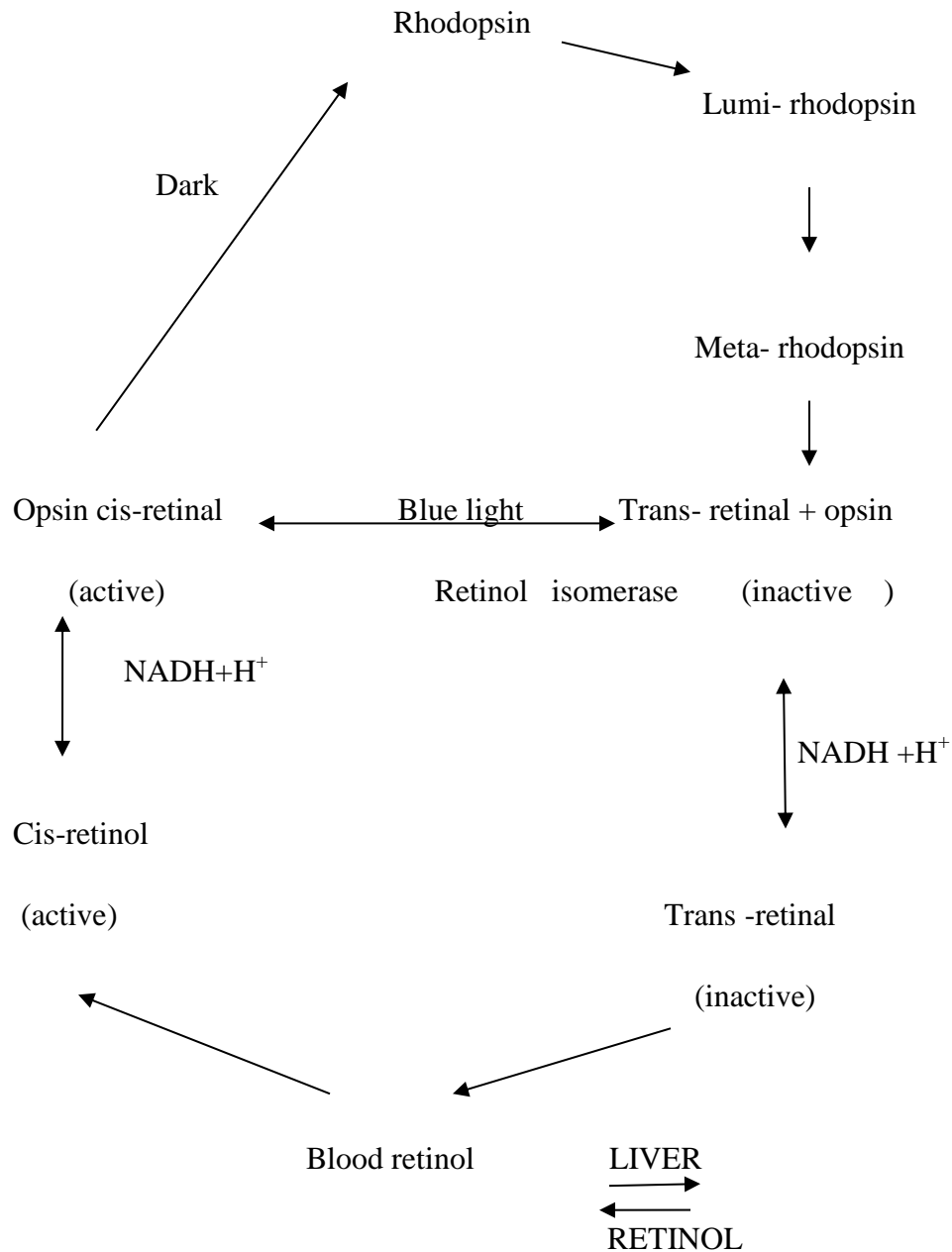
Subject Code: 0808

Model Answer

Page No: 28/ 41

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.





**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 29/41

The individual having vitamin A deficiency are unable to resynthesise rhodopsin and thus unable to see in the dim light and the condition is called night blindness.

**c) Define the following terms & give their significance: (1M each)**

**i) Acid value**

It is the number of milligram of KOH required to neutralize the free fatty acids present in 1 gram of fat or oil.

Free fatty acid content increase due to action by lipase from microbial growth

**ii) Iodine value:**

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

It helps to determine level of unsaturated fatty acids present in total fat or oil

**iii) 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.

It is a measure of mean molecular weight of all fatty acids present in fat or oil



---

**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 30/ 41

**d) Describe the following in brief: ( 1.5 M each)**

**i) Pellagra**

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.

**ii) Rickets**

Deficiency of vitamin D produces rickets in children.

It is primarily a disease of growing bones. During skeletal growth, vitamin D deficiency leads to inadequate deposition of calcium salts in newly formed bone matrix.

As a result bones may become soft, flexible leading to enlarged skulls, swollen joints, knock-knees occur when the child tries to stand up & walk. The ankles, knees wrist & elbows are swollen due to swelling and chest gives pigeon breast appearance.

Early morning sunlight is the richest source of vitamin D.



**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 31/41

**e) What are lymphocytes? Discuss their role in health & disease.**

**Lymphocytes(1 mark):**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: (2.0 mark)**

- 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.

**f) What is ketosis? Enlist ketone bodies. (3 M)**

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.

Appearance of ketone bodies in urine is called as ketonuria.

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



WINTER -15 EXAMINATION

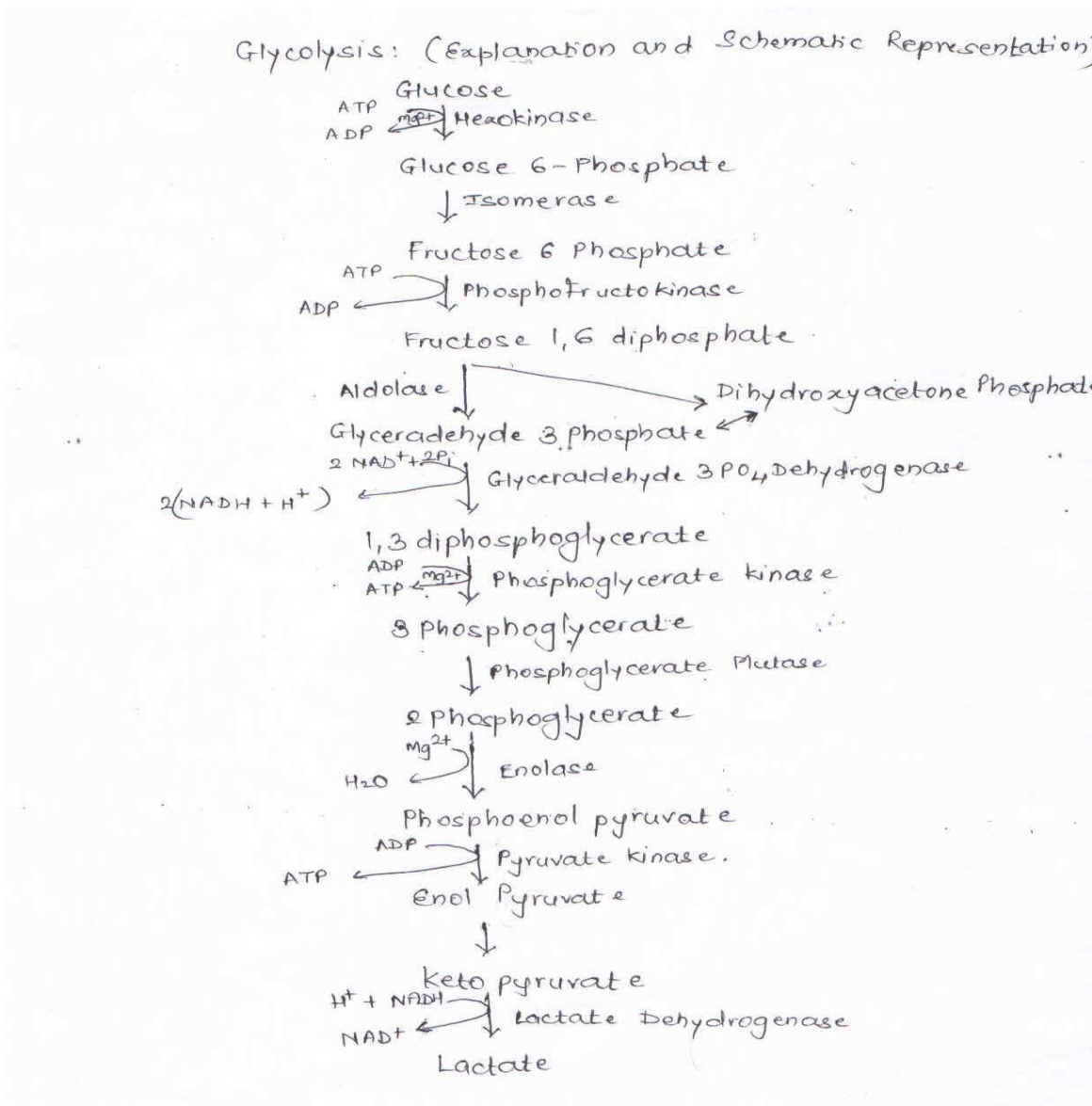
Subject Code: 0808

Model Answer

Page No: 32/ 41

Q.6. Attempt any four of the following:

a) Explain in brief reactions of Glycolysis: (4 M)







---

**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No: 33/ 41

Glycolysis: ( Detailed diagrammatic representation can be considered for full marks)

It's a main pathway for glucose oxidation

1. Phosphorylation of glucose to glucose 6 phosphate in presence of enzyme 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<sup>+</sup>
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



**WINTER -15 EXAMINATION**

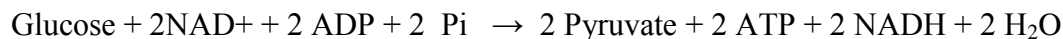
Subject Code: **0808**

**Model Answer**

Page No: 34 / 41

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:



**b) Define the following: (3 M for definition +1 M for example of any one)**

**i) 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.

- Eg.: hepatic microsomal enzymes.

**ii) Isoenzymes**

The multiple form of same enzyme are called isoenzymes, e.g. lactate dehydrogenase exist in the blood in five different isoenzyme forms i.e. LDH<sub>1</sub>, LDH<sub>2</sub>, LDH<sub>3</sub>, LDH<sub>4</sub>, LDH<sub>5</sub>



**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No:35 / 41

**iii) Zymogens**

Proenzyme or zymogen is the inactive form of enzyme.

It is activated and converted into the active enzyme form such as:

Pepsinogen (inactive) ----- Pepsin (active)

Trypsinogen (inactive)----- Trypsin (active).

**c) Explain the following: ( 2M each )**

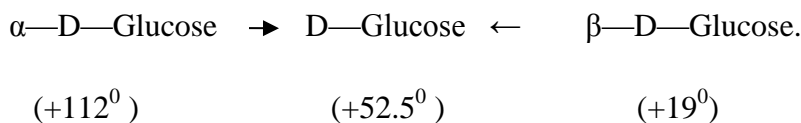
**i) Mutarotation**

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  $+112^{\circ}$  and on standing specific rotation falls to  $+52.5^{\circ}$  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  $+19^{\circ}$  which on standing also changes to  $52.5^{\circ}$

For example:



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



WINTER -15 EXAMINATION

Subject Code: 0808

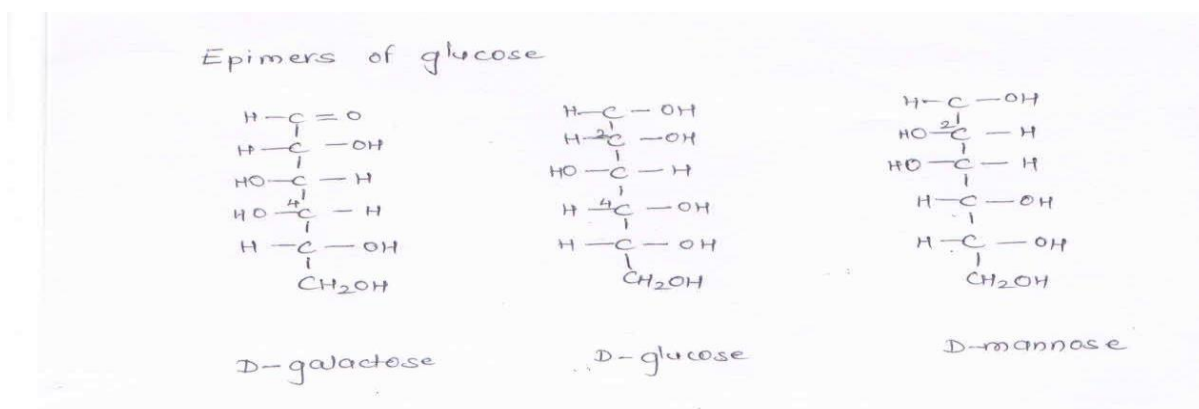
Model Answer

Page No: 36 / 41

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





**WINTER -15 EXAMINATION**

Subject Code: **0808**

**Model Answer**

Page No 37/41

**d)Discuss in brief Denaturation of proteins (4 M)**

Denaturation:

- The phenomenon of disorganization of native protein structure is known as denaturation.
- It results in loss of secondary, tertiary & quaternary structure of proteins.
- This involves change in physical ,chemical & biological properties of protein molecules.

Agents of denaturation:

- Physical: Heat, violent shaking, X-rays, UV radiation.
- Chemical: acids, alkalies, organic solvents, heavy metal salts etc.

Characteristics of denaturation:

- Helical structure is lost
- Primary structure with peptide linkages remains intact.(Peptide bonds are not hydrolyzed)
- Biological activity of protein is lost
- Denatured protein is insoluble

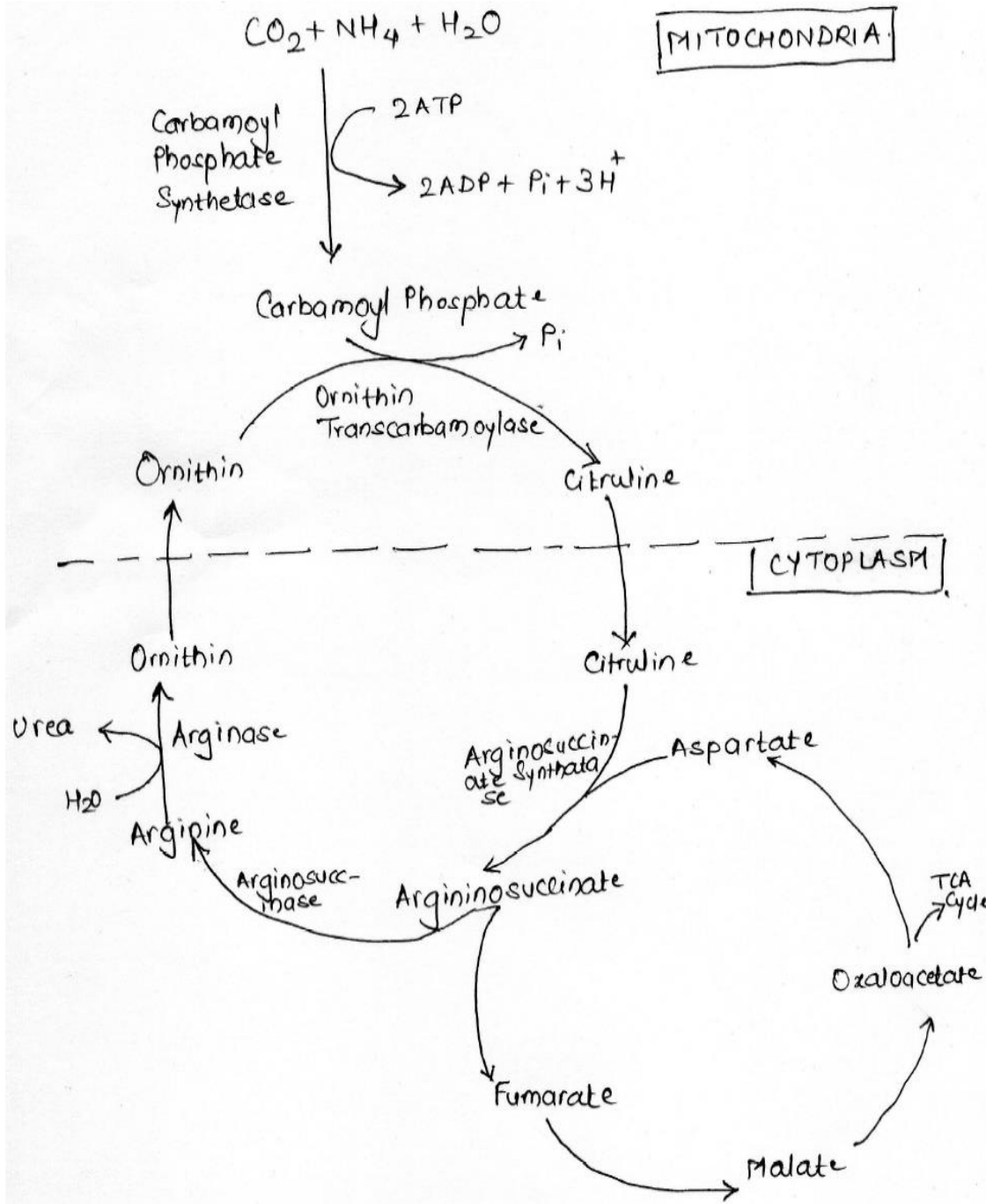
WINTER -15 EXAMINATION

Subject Code: 0808

Model Answer

Page No 38 /41

e) Explain in brief reactions of urea cycle (4M) ( Detailed diagrammatic representation can be considered for full marks)





**WINTER -15 EXAMINATION**

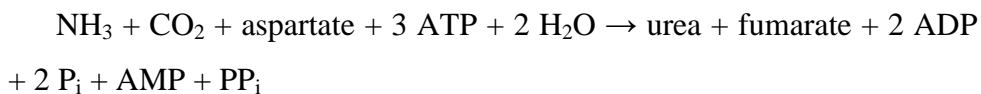
Subject Code: **0808**

**Model Answer**

Page No 39 /41

- 1) Molecule of ammonia, CO<sub>2</sub> & 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 citrulline 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 Argininosuccinate synthetase.
- 4) Argininosuccinate 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:



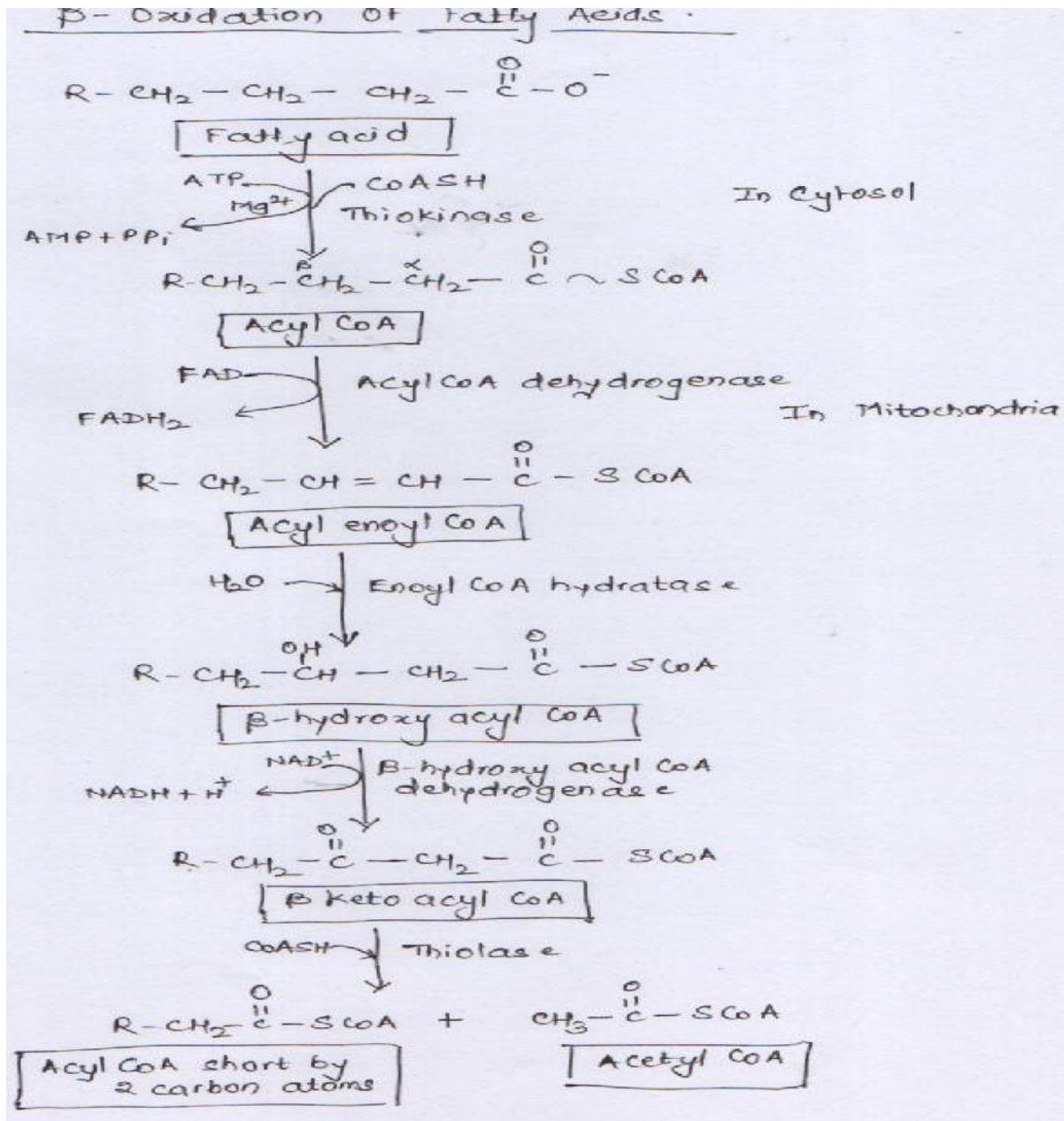
WINTER -15 EXAMINATION

Subject Code: 0808

Model Answer

Page No 40/41

f) Explain in brief reactions of beta oxidation of fatty acids ( Detailed diagramatic representation can be considered for full marks)







---

## WINTER-15 EXAMINATION

Subject Code: **0808**

**Model Answer**

Page No 41/41

Beta oxidation is the main pathway used to liberate energy by oxidation of fatty acid. It takes place in the beta carbon of fatty acid with removal of 2 carbons at a time from the carboxyl end of the molecule. The process repeats itself until the fatty acid with even number of carbon is completely converted to acetate molecules. Fatty acid containing even & odd number of carbon atoms as well as unsaturated fatty acids are oxidised by beta oxidation. It takes place in 5 steps in mitochondria of liver.

1. Activation of fatty acid.

Long chain fatty acid gets activated to fatty acyl CoA in presence of CoASH, thiokinase & ATP

2. Fatty acylCoA undergoes dehydrogenation in presence of acyl CoA dehydrogenase & FAD to give alpha,beta unsaturated fatty acyl CoA

3. Addition of water molecule across the double bond results into formation of Beta hydroxy acyl CoA in presence of Enoyl CoA hydratase

4. Hydroxyl group of Beta hydroxy acyl CoA gets oxidised to keto group forming Beta keto acyl CoA in presence of Beta hydroxy acyl CoA dehydrogenase & NAD<sup>+</sup>

5. Thiolytic cleavage of acyl CoA takes place in presence of Beta keto acyl CoA Thiolase & CoASH. Acyl CoA thus formed contains 2 Carbons less than original acyl CoA which undergoes further oxidation by Beta-oxidation. Acetyl CoA is also formed which enters TCA cycle.