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RAD II and DT II

Final term

BIOCHEMISTRY

Marks 50

Write note on following questions each carries equal marks

1) Write down the 4 steps involve in beta oxidation?

Ans : Beta oxidation

beta oxidation is the catabolic Pathways of fatsin which free fatty acids are converted acetyl COA.

.beta oxidation is the process in which saturated fatty acids are broken down for use in energy production

4 steps of beta oxidation

dehydrogenation

hydration

oxidation

Thyolisis

each step is catalysed by a distinct enzyme

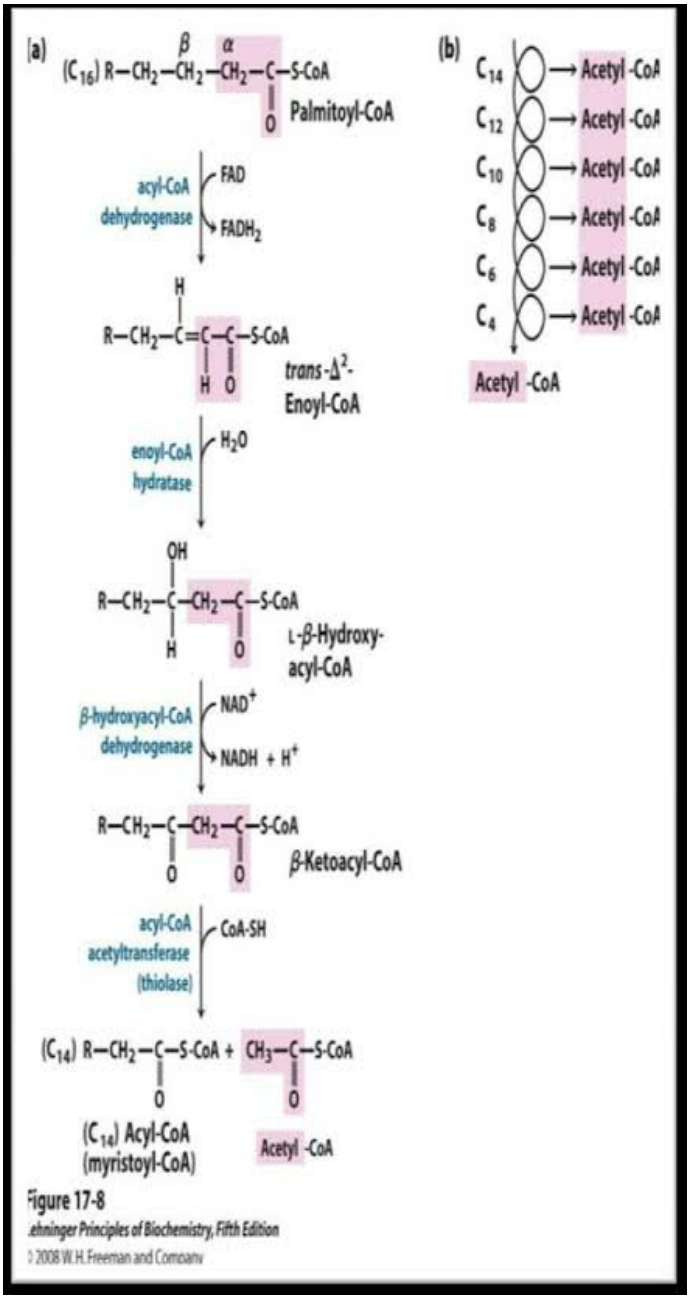

Figure 17-8
Lehninger Principles of Biochemistry, Fifth Edition
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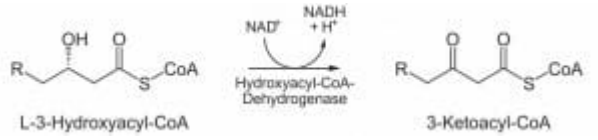
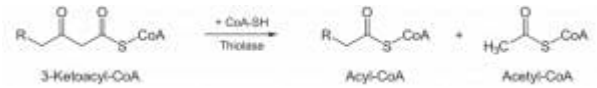
Dehydrogenation:



In this step, enzyme acyl CoA dehydrogenase will oxidized acyl-CoA.

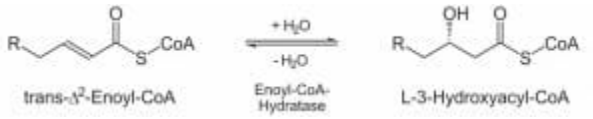
in between the second and third carbon C2 C3 of the CoA chain double bond is formed which is entering the beta oxidation cycle. Trans /\2 -enoyl-CoA (trans-delta 2 enoyl CoA) is the end product of this reaction this step produces FADH2 and uses fad which enter in citric acid cycoe and produces ATP which used as energy

Hydration



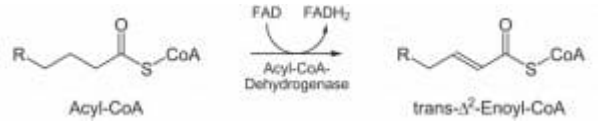
this is the second step in this double bond between C3 and C2 of trans -delta 2 enoyl CoA is hydrated which forming end product L-β hydroxyacyl CoA having OH group in C2 , in the place of double bond.another enzyme catalysed this reaction which is enoyl CoA hydratas. this is the steps which require water.

oxidation



this is the third step in this step the hydroxyl group in C2 of L-β hydroxy acyl CoA is oxidised by NAD+ in reaction which is catalysed by 3-hydroxyacyl-CoA hydrogenase.End products are NADH + H and β-ketoacyl CoA. In citric acid cycle NADH Is enter and thus produces ATP wgich is used as energy.

Thiolysis:



In this four step β-ketoacyl cleavage occur by a thiol group of another XoA molecule β-ketothiolase is reaction in which enzyme catalyzed.cleavage occurs between C3 and C4.acetyl -CoA molecule are the end product with the real two first carbon C2 and C3.and an acyl-CoA chain two carbons are shorter than original actyl CoA chain which enter beta oxidation cycle.

2) Write down clinical significance of the following enzymes

a) Alkaline phosphatase

b) Creatine kinase

c) gamma-glutamyl transferase

Ans : a) Alkaline phosphatase:

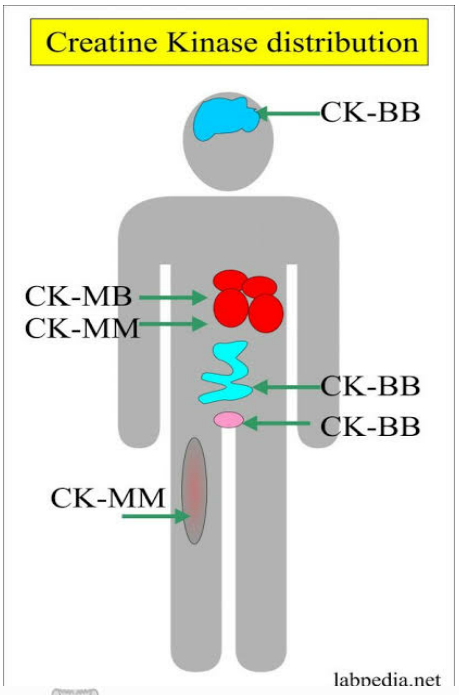
(1) Alp test is use to detect biliary obstruction (blocked bile duct) because alp high in the edges of cells which join to form bile ducts. One or more of them are obstructed.

(2) the conditions which causes increased avtivity of bone cells or affects bone growth can affect ALP levels in the blood.

(3) ALP test is used to detect bone disorders ,cancer, liver disease and biliary obstruction

(4) in conditions 8 damaged liver size increasr amount ALP into the blood

(5) if LP results are increased but not clear whether it's is because of liver a bone disease then test for ALP isoenzyme may also be done to determine the cause.



b) Creatine kinase:

• is composed of two polypeptide chain which are design (M) muscle and (B)brain

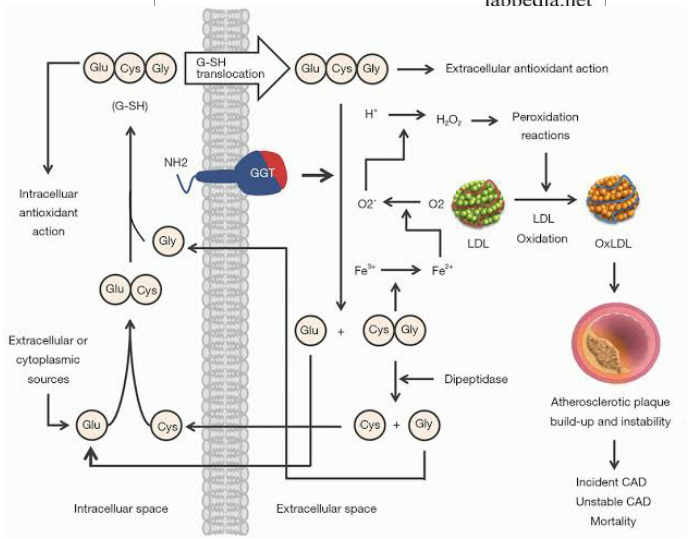
• it is very useful in detection of damage to myocardial and skeletal muscle tissue

• there are three isoenzymes which are present in Human tissues

1. CK-BB (brain form)N : Absent in blood

2. CK-MM(Skeletal Ms form) N > 95% of total activity

3. CK-MB(Cardiac form) N < 6% of total CK activity.



c) Gamma-glutamyl transferase:

Its elevated in all forms of liver disease such as obstruction of jaundice.
From the hepatobiliary system, enzyme present in serum appears to orginate primarily.
• infectious hepatitis
• cholecystitis
• biliary atresia
• cholangitis

3) How many proteins are involve in electron transport chain and how do electrons move in the electron transport chain?

Ans: *electron transport chain*

it is the series of four protein complexes that couple Redox reaction it is creating electrochemical gradient that leads to the creation of ATP in complete system which is name is oxidative phosphorylation .its occur in mitochondria both in photosynthesis and respiration.. electrons are formed by the breaking down of organic molecules and thus energy is released after that electrons enter in the chain after being excited by the light and energy release which is used to build carbohydrates.

four proteins

Complex I

Complex II

complex III

complex IV

complexes I , III and IV directly pump protons from the matrix into the intermembrane space

Complex II, does not directly pump protons but it does promote proton pumping in complexes III and IV

Proton pumping required energy and the four protein complexes get this energy by transferring electrons through a series of coupled reactions.this link process of electron transport is why the four complexes are collectively referrthis link process of electron transport is why the four complexes are collectively referred to as the electron transport chain!?

Complex I :

a byproduct of sugar metabolism called in NADH deposits to high energy electrons in complex I where they are passed along a change of redox centre. redox centres are clusters of atoms that havedifferent affinity for electrons based on their unique atomic configuration.

let's closely consider a pair of redox centres reveal two reasonswhy an electron moves from the top redox centre to the bottom first the bottom redox Centre has higher affinity than the top one.

second the distance between these adjacent redox centres is ideal for an electron jumps to a curve which explains why electrons typically done bypass the bottom redox Center . A small

amount of energy is released each time.an electron is passed between redox centres.

Complex I harnesses this energy across All the redox centers and uses it to pump protons for clarity the membrane arm of complex I is omitted. the last redox centre in complex I donates two electrons to the coenzyme Q molecule.

Complex II :

it is similar to Complex I in two important ways

high energy first high energy electrons also inter complex II via a byproduct of sugar metabolism Although here the molecule is

FADH2. FADH2 does not leave complex Tu but it's a prosthetic group that binds tightly to the protein. Succinate electron donor FADH2.

second, complex II also transfers electrons between several redox centre donating them to coenzyme Q. One major differwnce is that complex II does not use the energy liberated to pump protons.coenzyme Q molecules from complexes 1 and II donate their electrom to complex III.

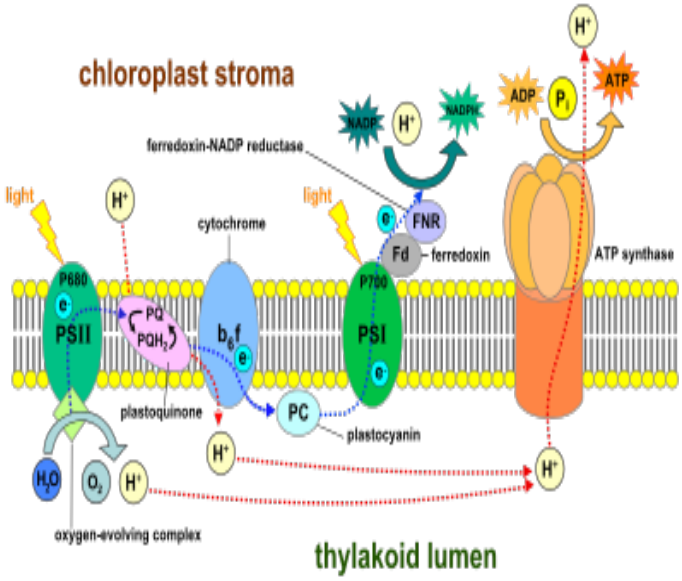
COMPLEX III :

one electron is a recycle able and can re enter complex III LATERA,but the other passes through two redox centers before reaching cytochrome c.

complex IV :

cytochrome C carries the electron to complex IV.

The electron transport chain ends in complex iv,Where are series of reactions fovolving four electrons converts a molecule of oxygen to two molecules of water.Proton gradient is strengthening because four protons from the matrix are incorporated into water molecules,and another four our pump into the intermembrane space.in the absence of oxygen the electron transfer comes to a halt,meaning that ATP synthesis also stops. indeed the reason we breathe oxygen is so that it can serve as the final electron acceptorat the end of the electron transport chain.



Electrons move in electron transport chain

Exergonic process

electrons flow into electron transport chain row and exergonic process energy from the Redox reaction create electrochemical Proton gradient which derive the synthesis of adenosine triphosphatesulphate. In anerobic respiration other electron acceptors are used such as sulphate

in aerobic respiration flow of electrons terminate with molecular oxygen being final electron receptors

in electron transport chain Redox reaction drive-by Gibbs free energy state of the componentsit is related to quantity called redox potential the electron transport chain always energy of redox reaction which occur when transferring electrons from low redox potential to higher redox potential creating electrochemical gradient Electro chemical gradient creates that drives different uses of ATP with oxidative phosphorylation with ATP synthesis

inner mitochondrial membrane

In inner mitochondrial membrane ,site of oxidative phosphorylation and electron transport chain is found by the process of respiration in reduced compounds which is NADH and FADH which is used by electron transport chain to pump protons into intermembrane space generates the electrochemical gradient over the inner mitochondrial membrane

photosynthetic eukaryotes

On the thylakoid membrane the electron transport chain is found light energy which derive reduction of components of electron transport chain causes synthesis of ATP while in bacteria electron transport chain can vary over species.

4) What are the starting point of of uric acid formatiom and normal range of uric acid ?

Ans: *Uric acid :*

Uric acid is a waste product found in blood. It's created when the body breaks down chemicals called purines. Most uric acid dissolves in the blood, passes through the kidneys and leaves the body in urine. Food and drinks high in purines also increase the level of uric acid

It is a heterocyclic compound of Nitrogen, carbon, Oxygen and hydrogen with the formula of C5H4N4O3. it forms sites and ions which is called urates and acid urates such as Ammonium acid urate. product of metabolic breakdown of purine nucleotids high blood concentration of uric acid can cause gout.its also asaociated wirh other discorders such as diabetes and formation of kidney stones.

Excreation:

In urine it is excreted or passes through intestines to regulate normal levels.

Normal Range of uric Acid:

• 3.4-7.0 mg/dL in males

• 2.4-6.0 mg/dL in females

5) How uric acid formation takes place in body?

Ans : uric acid

it is waste product which is created by the normal break down of purine it is naturally occurring substances which is found in foods such as mushrooms dried beans ect uric acid is cleaned out of the body by the help of Kidneys and passes out of the body in the form of faeces or peace if you have high level of uric acid it will be a disease like gout.

uric acid synthsis

uric acid is the end product of purine metabolism in humans

the nucleotide monophophate are converted to nucleosides form like adenosine guanosine by the action of nucleotidase.

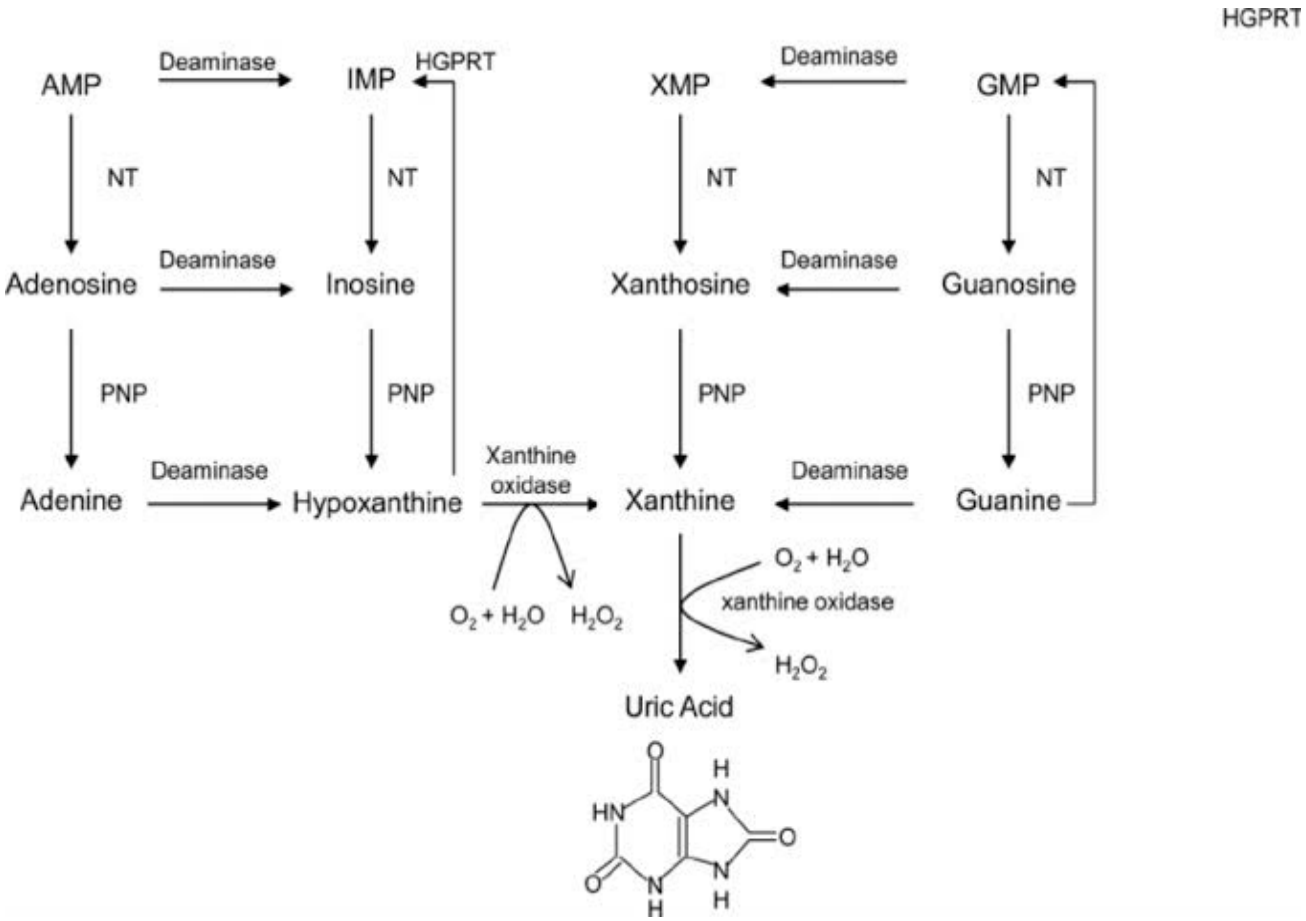
The amino group either from AMP or adenosime can be removes to produce imp or inosine

Guanosime and insine are converted into hypoxanthine and guanine by purime nucleosidephospyralase.

Formation of uric acid

1) Uric acid is the final break down of purine metabolism it is circulates in the plasma is Sodium urate and excreted by the kidney

2) nucleic acids are two types which is pyrimidine and purine



3) The catabolism of purine adenine guanine and produces uric acid

4) after breakdown of nucleic acid the Uric acid form which is transported to the liver and blood which is then filtered through glomerular filtrate and appeared in the urine

5) the levels of uric acid concentration is called hyperuricemia due to increase urate formatiom or excretion decreased.

Purine _____ liver ____xanthine ____uric acid ___blood urate ___kidney ___excreted in urine____