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Section: B
Dep : Radiology
Instructor:

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① Question: Write down steps involved in urine formation?

Answer:

Urine formation:

Detenition:

The kidney filter unwanted substances from the blood and produce urine to excrete them.

Urine is a waste by Product formed from excess water and metabolic waste molecules during the process of renal system filtration. The Primary function of the renal system is to regulate blood and Plasma osmolarity, and waste

removal via urine is essentially a convenient way that the body performs many function using one process.

Urine formation occurs during three process:

① filtration
② Reabsorption
③ secretion.

Filtration:

During filtration, blood enters the afferent arteriole and flows into the glomerulus where filterable blood components, such as water and nitrogenous waste, will move towards the inside of the glomerulus, and nonfilterable components, such as cells and serum albumins, will exit via the efferent arteriole. These filterable components accumulate in the glomerulus to form the glomerular filtrate.

Normally, about 20% of the total blood pumped by the

heart each minute will enter the kidney to undergo filtration, this is called filtration fraction. The remaining 80% of the blood flows through the rest of the body to filtrate tissue perfusion and gas exchange.

Reabsorption:

The next is reabsorption during which molecules and ions will be reabsorbed into the circulatory system. The fluid passe through the component of nep-hron (the proximal distal convoluted tubules, loop of Henle the collecting duct) as water and ions are removed as the fluid osmolarity (ion concentration) changes. On the collecting duct, secretion will occur bedow the fluid leave the ureter in form of urine.

Secretion:

During secretion some substances such as hydrogen ions, creatinine, and drugs

will be removed from the blood through the peritubular capillary network in to the collecting duct. The ord product of add these processes is urine which is essentially a collection of substances that has not been reabsorbed during glomerular filtration or tubular reabsorption.

ii Question:

Write down clinical significane of the following enezyme?

Answer:

Alkaline Phosphate (ALP):

- Widely distributed, high concentration in intestines, liver, bone, spleen, Placenta and kidney.
- The main sources of serum ALP are hepatobiliary tree and bone disorders.
- Elevated levels during healing

of fractures, active growth and during the 3rd trimester of pregnancy.

- ↑↑ serum ALP activity in liver disease is mainly due to cholestasis.
- Decreased levels are found in inherited conaition.

Creatine Kinse:

Elevation of CK is an indication of damage to muscle. CK vadue is increased in myocardial infaction and muscle injury such as muscular dystrophy, acute rhabdomyolysis due to strenuous exercise, myocarditis, adrenodic myopath and so on.

- Following a myocardial infar action, CK rises measurably with in a 4-6 hours period. Maximal vadues are observed with in 24 hours, after which time, the activity returns to normal

γ- glutamyltransferase (GGT):

- Used for glutathione synthesis.
- Normal range: 10-30 U/L
- Moderate elevation observed in:
  - infective hepatitis and prop-
    nte cancers.

- GGT is increased in alcoholics despite normal liver function tests
  ⇒ Highly sensitive to detecting alcohol.

iii.

Question:

Write down steps involved in beta oxidation?

Answer:

Beta oxidation:

Definition:

Beta oxidation is a metabolic proless involving multiple steps by which fatty acid molecules are broken down to produce energy.

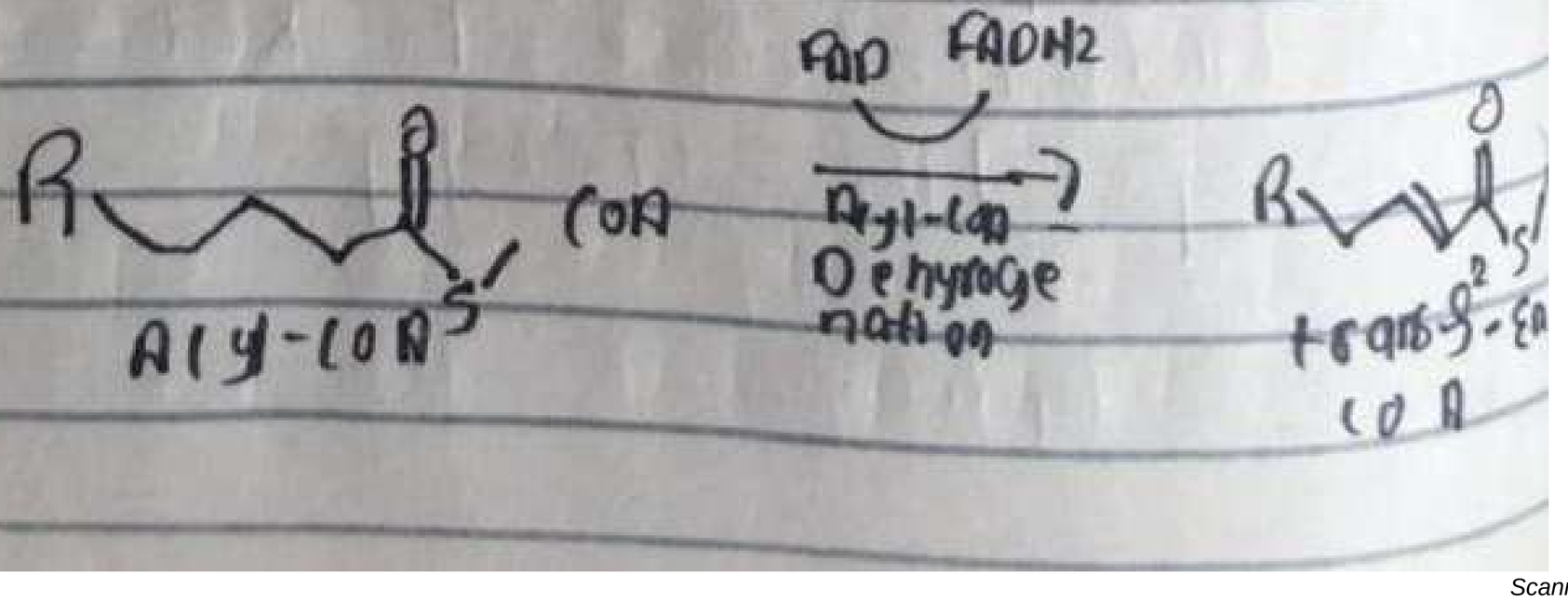
P.T.O

Beta oxidation steps:

Beta oxidation takes place in four steps, dehydrogenation, hydration, oxidation and thyolisis. Each step is catalyzed by distinct enezyme.

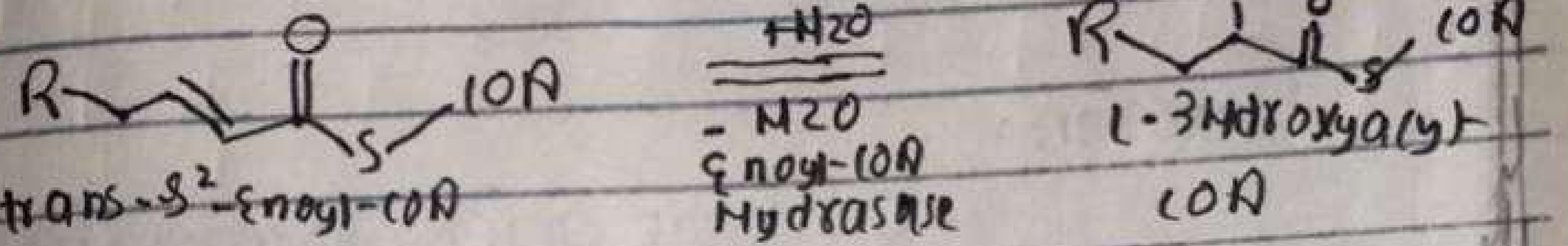
Dehydrogenation:

In the first step, acyl-CoA is oxidized by the enezyme acyl CoA dehydrogenase. A double bond is formed between second and third carbons (C2 and C3) of the acyl-CoA chain entering the beta oxidation cycle; the end product of this reaction is trans-Δ^2-enoyl-CoA (trans-delta 2-enoyl CoA). This step uses FAD and produces $FADH_2$ which will enter the citric acid acid cycle and form ATP to be used as energy.



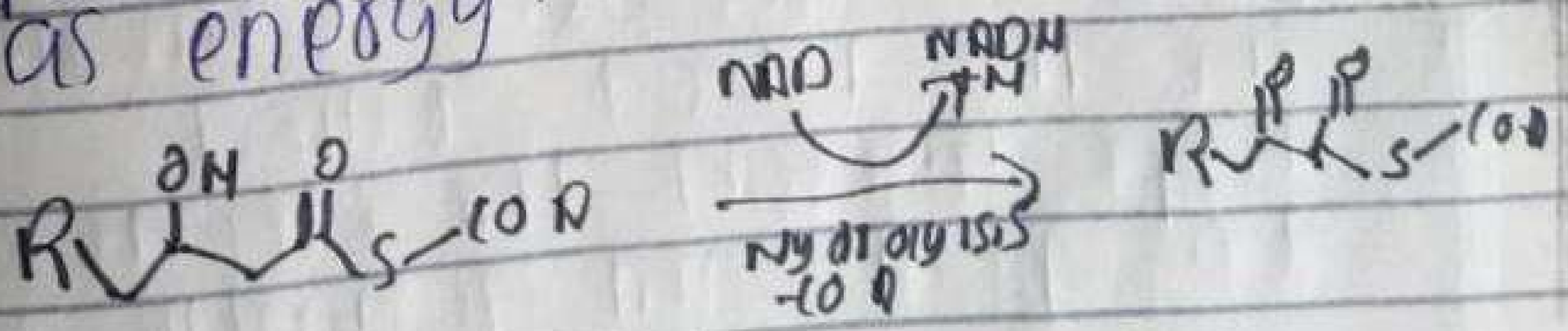
Hydration:

On the second step, the double bond between C2 and C3 of trans-Δ^2-enoyl-CoA is hydrated, forming the end product L-β-hydroxyacyl CoA, which has a hydroxyl group (OH) in C2, in the place of double bond. This reaction is catalyzed by another enzyme: enoyl CoA hydratase. This step requires water.



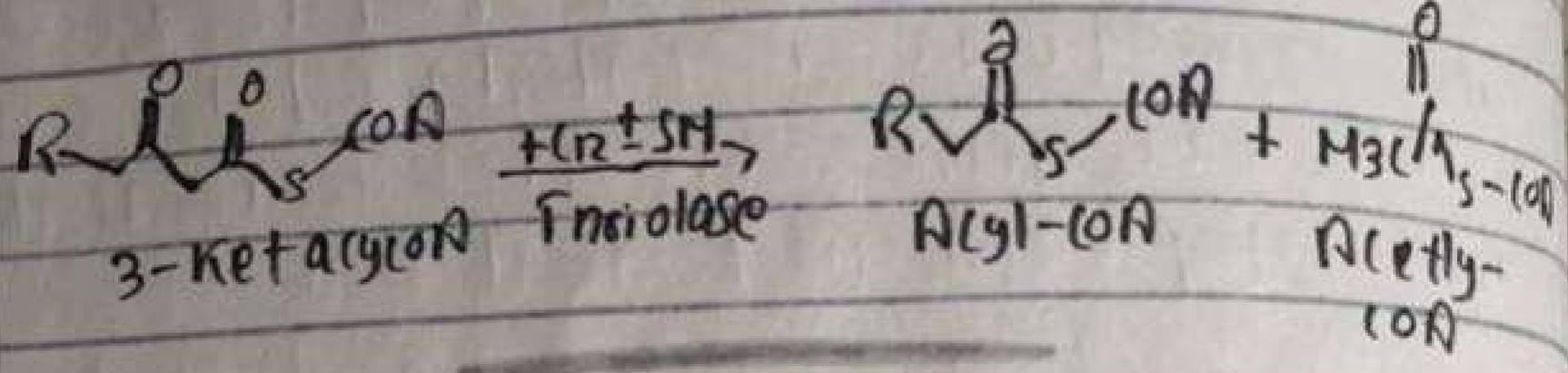
Oxidation:

On the third step, the hydroxyl group in C2 of L-β-hydroxyacyl CoA is oxidized by NAD+ in a reaction that is catalyzed by 3-hydroxyacyl-CoA dehydrogenase. The end product are β-keto acyl CoA and NADH + H. NADH will enter the citric cycle and produce ATP that will be used as energy.



Thiolysis:

finally in fourth step, β-ketoacyl CoA is cleaved by a thiol group (SH) of another CoA molecule (CoA-SH).



(4) Question:

How uric acid formation takes places in body?

Answer:

Urine Acid Formation:

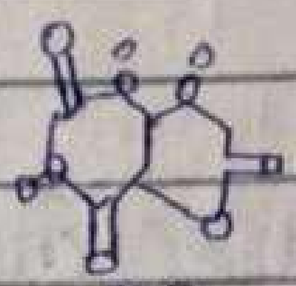
The formation of uric acid is through the enzyme xanthine oxidase, which oxidizes oxypurines. Normally a small amount of uric acid is present in the body, but when there is an excess amount in the blood, called hyperuricemia this can lead to gout and formation

Of Kidney stones

Uric Acid compound summary:

Pubchem CID: 1175

Structure:



2D

chemical safety: laboratory chemical safety summary (LCSS) datesheet.

Molecular formula:

$C_5H_4N_4O_3$
Uric acid
69-93-2
urate.

Molecular weight:

168.111g/mol

Uric Acid is a white tasteless odorless crystalline product of product of protein metabolism, found in blood and urine, as well as trace amount food in various organ of body.

(v) Question:

How many proteins are involved in electron transport chain and how do electrons move in the electron transport chain?

Answer:

Number of Protein involved in electron transport chain:

Four Protein:

There are four Protein complexes (labeled I-IV) in the electron transport chain, which are involved in moving electrons from NADH and $FADH_2$ to molecular oxygen. Complex I establishes the hydrogen ion gradient by pumping four hydrogen ions across the membrane from matrix into the intermembrane space:

o How electron move in electron transport chain:

The electron transport chain (ETC) is a series of complexes that transfers electron from electron donors to electron acceptors via redox (both reduction and oxidation occuring simultaneously) reactions, and couples this electron transfer with the transfer of protons (H^+ ions) across a membrane. The electron transport chain is built up of Peptides, enzymes, and other molecules.