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B.Sc Part-III Paper – V

Topic:- Write Short Notes on:

1. Renal hormones
2. Ornithine cycle (Urea formation)
3. Glycogenesis
4. Amino acid

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1. **Renal hormones**– Hormones secreted by kidney are called renal hormones. The hormones are—

(i) Renin– It is secreted by juxtaglomerular cells of cells of kidney. This hormone is secreted in low blood pressure state. This hormone stimulates liver to secrete angiotensinogen, which is converted first into angiotensin I and then into angiotension II. The latter induces release of more amount of aldosterone by Zona glomerulosa of adrenal Cortex.

(ii) Erythropoietin– Low oxygen pressure increases production of erythropoietin by kidney. This infensifies erythropoiesis by increasing bone marrow.

2. **Ornithine Cycle (Urea formation)**– Ornithine Cycle is described by Krebs and Henseleit. One molecule of urea is formed by the consumption of two molecules of ammonia. One molecule of CO_2 and three molecules of ATP. This occurs as—

Ammonia produced by deamination combines with CO_2 derived from decarboxylation reaction in the presence of Biotin, acetylglutamate, two molecules of ATP and enzyme carbalnyl phosphate synthetase. In this reaction Carbonyl phosphate forms.

Enzyme ornithine carbamyl transferase transfers Carbamyl group (–CO–NH_2) from Carbamyl phosphate to ornithine leading to the formation of Citrulline.

The citrulline condenses with aspartate in the presence of the enzyme arginosuccinate synthetase leading to the formation of argino succinate. In this condensation one molecule of ATP is utilized.

Arginosuccinate is cleaved into arginine and fumarate.

Arginine is hydrolytically cleared into urea and ornithine in presence of enzyme arginase. The latter again combines with NH_3 to repeat the ornithine arginine Cycle. Arginase plays important role in urea formation that takes place in liver.

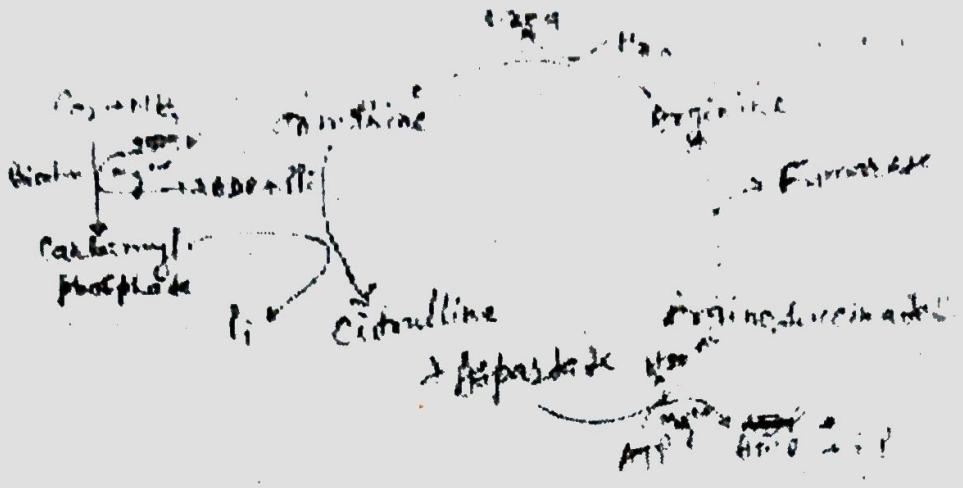


Fig. Showing Ornithine Cycle (Or Urea Cycle)

3. Glycogenesis–In normal physiological condition blood contains 80–100 mg glucose/100 ml. When its level increases in blood, it is converted into glycogen in presence of a hormone insulin. The formation of glycogen from glucose in the body is called glycogenesis. It occurs mainly in liver and muscles and stored. The process of glycogenesis takes place as—

(i) glucose is phosphorylated to glucose–6–phosphate by ATP in the presence of gluco kinase enzyme and Mg^{++} ions.

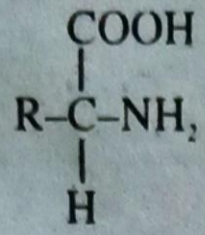
(ii) glucose–6–phosphate is isomerised to fromglucose 1–phosphate by the enzyme phosphoglucomutase.

(iii) glucose-1-phosphate combines to uridine triphosphate (UTP) to from uridine diphosphoglucose (UDPG) and inorganic phosphate (PPi). This reaction catalysed by the enzyme uridine diphosphate glucose pyrophosphorylase.

(iv) Now the enzyme glycogen synthetase activates UDPG–glucose to transfer its glucose to the non-reducing end of pre-existing straight glycogen chain (polysaccharide primer). This results in addition of one more glucose molecule to an existing straight glycogen forming α–1, 4 glycogidic bond. This straight unbranched form of glycogen is called amylose form. The UDP is freed in this reaction which may be converted to UTP by ATP.

(v) When straight chain glycogen attains the length of 8 glucose units, it is acted upon by a branching enzyme amylo (1, 4 – 1, 6) transglycorylase. This enzyme catalyses the cleavage of an α–1, 4 linkage near the growing end of the chain and transfer the fragment to form an α–1, 6–linked branch point on the linear chain. In this way a highly branched glycogen molecule containing sometimes thousand glucose units is formed.

Amino acid–Amino acid is the structural unit of protein. Each amino acid is formed by the combination of one or more amino groups (NH_2), one or more carboxyl group (COOH) and a hydrogen atom linked together to the common carbon atom. The common Carbon atom is called α–carbon atom. The general formula of amino acid is–



(Where R is alkylradicle)

The chemical nature of R–group is different for each amino acid. The simplest amino acid is glycine in which R is represented by H atom.

The amino acids are twenty types namely–glycine, alanine, serine, asparctic acid, glutamic acid, cystine, valine, leucine, isoleucine, threonine, methionine, glutamine, lysine, arginine, phenylalamine, aspargine, histidine, proline, tyrosine & tryptophan.

On the basis of acid or basic nature amino acids are of three types—

(a) Acidic amino acids–When amino acid contains more acidic groups in comparison to amino groups then called acidic amino acid. Ex–Aspartic acid, glutamic acid etc.

(b) Basic amino acids–Amino acids containing more amino groups in comparison to acidic groups then called basic amino acids. Ex—Lysine, Arginine, Histidine etc.

(c) Neutral amino acids–Amino acids containing one amino group and one acidic group are called neutral amino acids Ex.–glycine, Alanine, Valine, Leucine, Serine etc.

On the basis of essentiality amino acids are of two types---

(a) Essential amino acids–The amino acids those are not synthesized in body are called essential amino acids. These amino acids are taken from outside. Eight amino acids out of twenty amino acids are essential. These are Leucine, Isoleucine, Lysine, Valine, Methionine, Phenylalamine, threonine, Tryptophan.

(b) Non-essential amino acids–The amino acids those are synthesized in body and are not essential to be taken from outside are called non-essential amino acids. These are twelve in number. Ex—glycine, Alanine, glutamic acid etc.