MODULE 8: ENZYMES

Q.1. Short answer questions:

(i) Cofactor +----------= holoenzyme
(ii) SI unit of enzyme activity is ---- and that for specific enzyme activity is ----------
(iii) 1 IUnit of enzyme activity = ----- nanokatals
(iv) E.C. No 4 and E.C. No 6 stand for ---- and ------ class of enzymes
(vi) Lock and Key model**:** ------- **::** -------**:** Daniel Koshland
(vi) Smaller the K_m, ------ is the affinity of the enzyme for the substrate
(vii) In competitive inhibition, K_m------- while V_{max} --------
(viii) In uncompetitive inhibition, K_m ----- and V_{max} -----
(ix) Common industrial enzymes used for skin-dehairing, bread making and transesterification are ----, ----- and ---- respectively.
(x) Two enzymes used in animal feed industry are ----- and -----
(xi) E.C. no 1.1.1.1 stands for ------- enzyme.

Answers:

i. Apoenzyme
ii. Katal, katal kg^{-1}
iii. 16.67
iv. Lyases, Ligases
v. Emil Fischer, Induced Fit
vi. Higher
vii. Increases, remains same
viii. Decreases, decreases
ix. Protease, amylase, lipase
x. Phytase, xylanase
xi. Alcohol dehydrogenase

Q.2. State the factors affecting rate of a reaction?

Ans: The rate of reaction is enhanced by many factors. Active site assists by:

- Facilitating the correct proximity and orientation of the substrate.
- Covalent catalysis by amino acids like lysine.
- Acid base catalysis by amino acids such as lysine, arginine, aspartic acid or glutamic acid.
- Putting strain on substrate to enter into transition state and product formation.

Q.3. State the Michael is Menten equation and explain its various terms.

Ans: $\upsilon = V_{\max} \frac{[S]}{K_m + [S]}$ V_{max} represents the maximum velocity/ rate, [S] denotes the Substrate concentration respectively, Km denotes the Michael is Menten constant.

Q.4. Define K_m and k_{cat}. What is the mathematical relation between the two?

Ans: $$\upsilon = V_{\max} \frac{[S]}{K_m + [S]} = k_{cat}[E]_0 \frac{[S]}{K_m + [S]}$$

k_{cat} is the turnover number, defined as the maximum number of substrate molecules converted to product per enzyme molecule per second Its unit is $(time)^{-1}$
The Michael is - Menten constant K_m is the substrate concentration at which the reaction rate is at half-maximum, and is a measure of the substrate's affinity for the enzyme. It has the units of concentration. A small K_m indicates high affinity, meaning that the rate will approach V_{max} more quickly.

Q.5. Discuss the inaccuracy of the Line weaver Burk plot over Eadie-Hofstee and Hanes-Woolf plot?

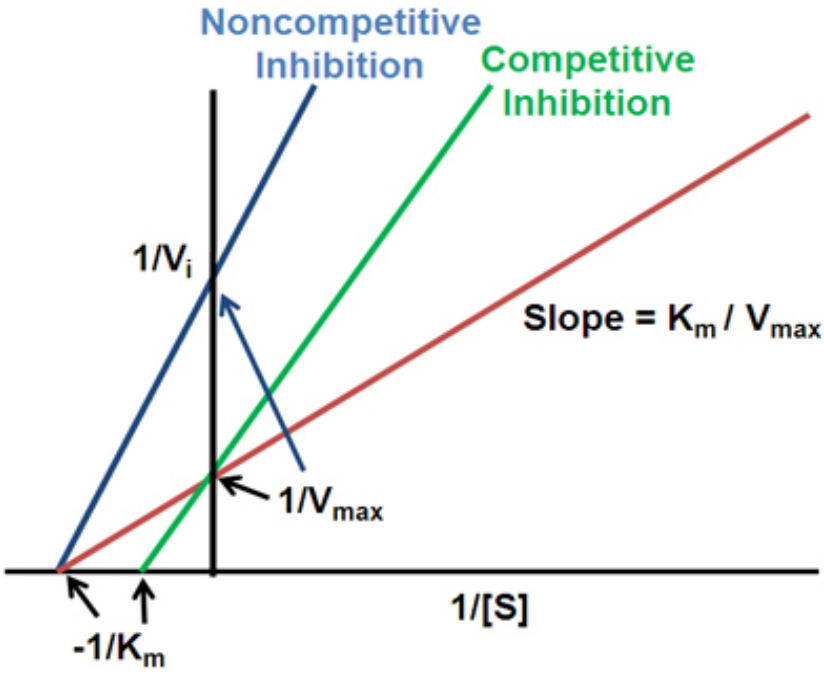
Ans: The Line weaver – Burk plot, at times, skews the importance of measurements taken at low substrate concentrations and, thus, can yield inaccurate estimates of V_{max} and K_m

Q.6. Distinguish between nonspecific and specific inhibitors?

Ans: Nonspecific inhibition includes any physical or chemical changes that **denatures** the enzyme; thereby making it inactive. Specific Inhibitors are molecules which exert their effects upon the enzyme. Most poisons work by specific inhibition of enzymes.

Q.7. Graphically represent the different types of enzyme inhibition?

Ans:



Q.8. What is allosteric regulation? Name an allosteric enzyme?

Ans: Allosteric regulation is the regulation of an enzyme upon binding of an effector molecule at a site other than its active site. The other site is termed as allosteric site. An example of an allosteric enzyme is aspartate trascarbamoylase.

Q.9. What are ribozymes. Explain their significance?

Ans: A ribonucleic acid enzyme is an RNA molecule capable of catalyzing a chemical reaction. Ribozymes are much like proteins, in having a well defined tertiary structure required for their function. It contains an active site that consists entirely of RNA. Many natural ribozymes behave as self-cleaving enzymes or cleave the bonds in other RNAs. Some examples of ribozymes include RNase P, Group I and Group II self splicing introns, hammerhead ribozyme, and the hairpin ribozyme.

Q.10. What do you understand by the active site of an enzyme?

Ans: Enzymes catalyze chemical reactions by binding of the substrate (or substrates) to the active site on the enzyme. The active site is the specific region of the enzyme which combines with the substrate. The active site has a unique geometric shape that is complementary to the geometric shape of a substrate molecule. The binding of the substrate to the enzyme causes the reactions that lead to the formation of products. The products are released from the enzyme surface to regenerate the enzyme for another reaction cycle.