Exercise

Q1. In order to catalyse a reaction, an enzyme is required to

- (a) be saturated with substrate
- (b) decrease the activation energy
- (c) increase the equilibrium constant
- (d) increase the activation energy

Ans- (a) be saturated with substrate.

Q2. Pepsin is a gastric enzyme. Does it have an acidic or alkaline optimum pH? What happens to pepsin when it enters the duodenum?

Ans- Pepsin acts within the stomach so its optimum pH is around 2, an acid pH. When the enzyme passes into the duodenum it meets a higher pH and its enzyme activity ends.

Q3. What is relation between vitamins and enzyme cofactors?

Ans- Vitamins help in many ways in our body for each an every enzymetic activity. There are many enzymes which require cofactors for their catalytic activity. The cofactor which is complex organic molecule is known as co enzyme. Most of the co-enzymes are derived from vitamins. Cofactors of enzyme work with vitamins and play important role in the catalytic reaction.

Q4. What is effect of temperature, pH and substrate concentration on catalytic activity of enzyme?

Ans- There are some important factors which effect the enzyme activity:-

- Temperature- When the temperature increases the rate of an enzyme catalysed reaction increases. It increases up to a maximum and them fall. The graph is plotted between temperature and enzyme activity, the bell-shaped curve is obtained. There is optimum temperature which at maximum rate of reaction occurs. It is different for different enzymes. Most of the enzyme are in between 40°c to 45°c.
- 2. pH- Each enzyme has its optimum unique pH. The graph plotted between pH and enzyme activity which results in bell shaped curve. At optimum pH the rate of reaction is greatest. The optimum pH is which is maximum at the activity of enzyme. Many of the enzymes show optimum rate of reaction at neutral pH.

3. Substrate concentration- This is the factor which influence the enzyme activity. As the concentration of substrate increases the rate of reaction increases. It is because of the interaction of substrate molecules with the enzyme molecule.

Q5. The rate determining step of Michaelis-Menten kinetics is

- (a) the complex dissociation of ES complex
- (b) the complex formation
- (c) the product formation
- (d) the product degradation

Ans- (a) The complex dissociation of complex ES.

Q6. Define Km and it's significance.

Ans- Km is defined as the substrate concentration at which $v0=\frac{1}{2}$ Vmax, is increased in presence of inhibitor and denoted by symbol Km.

Significance:

Km substrate concentration in noncompetitive inhibition has no effect as a inhibitor which decrease amount of functional enzyme. In uncompetitive inhibition it does not inhibits by increasing the substrate concentration. The value is altered.

Q7. What is meant by one unit of enzyme?

Ans- Do it yourself.

Q8. What is specific activity of an enzyme?

Ans- Specific activity of enzyme is the activity in which mole of product is formed by an enzyme in a given amount under the given conditions per milligram of proteins. This activity is activity which represents a measurement of enzyme purity in the mixture.

Q9. Briefly describe first and second law of thermodynamics.

Ans- 1. First law of thermodynamics: According to first law of thermodynamics the energy exchange takes place in between system and surrounding in any process. It states that energy can neither be created nor be destroyed, but it can be converted in to other forms of energy.

 $\mathsf{E} = \mathsf{E}\mathsf{B} - \mathsf{E}\mathsf{A} = \mathsf{Q} - \mathsf{W}$

The equation states that the change of energy depends only on the initial and final stages of system. It does not depend on the path of transformation.

2. Second law of thermodynamics: The second law of thermodynamics states that entropy or disorder of universe will always be increasing. According to this law, if the sum of the entropies of system and it's surrounding increases then a process can occur spontaneously.

(S system+ S surroundings) > 0 (for a spontaneous process)

Q10. Define entropy. What is relationship between free energy and entropy.

Ans- Entropy is defined as degree of randomness or disorder of a system and it explains whether reaction takes place or not.

The free energy is the term which is obtained by combining the two laws.

G= H – TS, this equation explains the relationship between the free energy (G) and entropy in chemical reaction at constant temperature (T) and pressure (P).

Q11. Why ATP is called as universal energy currency?

Ans- The living organisms derive free energy from environment. As the photosynthetic organisms take this energy from sunlight and chemotrophs obtain it from oxidation of food stuff. The free energy is used in many processes which are synthesis of macromolecules and precursors, in active transport across the membrane, in muscle contraction and in fidelity of genetic information transfer. Before these processes the free energy is converted into the Adenosine triphosphate which is known as ATP. This plays an important role in transfer of free energy from exergonic process to endergonic process. Thus ATP is a universal energy currency.