FREQUENTLY ASKED QUESTIONS

1. **Define enzymes?**

Ans. Enzymes are macromolecular biological catalysts. Enzymes accelerate, or catalyze, chemical reactions. The molecules at the beginning of the process upon which enzymes may act are called substrates and the enzyme converts these into different molecules, called products. Almost all metabolic processes in the cell need enzymes in order to occur at rates fast enough to sustain life.

2. **Name different types of reactions catalyzed by enzymes?**

Ans. There are six types of reactions catalyzed by enzymes which includes: (a) oxidoreduction, (b) transfer, (c) hydrolysis, (d) formation of double bonds without hydrolysis, (e) isomerization, and (f) ligation.

3. **Define oxidoreductases?**

Ans. Oxidoreductases are enzymes that oxidize or reduce substrates by transfer of hydrogens or electrons or by use of oxygen. The systematic name is formed as "donor:acceptor oxidoreductase." An example, including systematic name followed by trivial name and EC number in parenthesis, is:

$H_2O_2 + H_2O_2 = O_2 + 2H_2O$

which gives hydrogen peroxide:hydrogen peroxide oxidoreductase (catalase, EC 1.11.1.6).

4. **Define Lock and key theory?**

Ans. According to Fildes only a specific substrate can combine with the active site of a particular enzyme as a specific key fits to open a specific lock. In this enzyme molecule posses an active site to fit correctly with the substrate forming ES complex. When reaction completed ES complex breaks into products and enzymes. Enzymes remain intact.

5. **Define isomerase enzymes?**

Ans. Isomerases are enzymes that bring about an isomerization of substrate.

The systematic name is formed as "substrate prefixisomerase." The prefix indicates the types of isomerization involved, for example, "maleate *cis-trans*- isomerase" (EC 5.2.1.) or "phenylpyruvate keto-enolisomerase" (EC 5.3.2.1). Enzymes that catalyze and aldose-ketose interconversion are known as "ketol-isomerases," for example, "L-arabinose ketol-isomerase" (EC 5.3.1.4). When the isomerization consists of an intramolecular transfer of a group, such as 2-phospho-D-glycerate = 3-phospho-D-glycerate, the enzyme is named a "mutase," for example, "D-phosphoglycerate 2, 3-phosphomutase" (EC 5.4.2.1). Isomerases that catalyze inversions of asymmetric groups are termed "racemases" or "epimerases," depending on whether the substrate contains one or more than one center of asymmetry, respectively. A numerical prefix is attached to the word "epimerase" to show the position of inverstion. An example is

L-Alanine = D-alanine

with alanine racemase (alanine recemase, EC 5.1.1.1).

6. **Enlist different enzymes for chemical alteration of pigments in fruits and vegetables?**

Ans. Three key enzymes responsible for chemical alterations of pigments in fruits and vegetables are lipoxygenase, chlorophyllase, and polyphenol oxidase.

7. **Describe the role of α-amylases in food?**

Ans. The α-amylases, found in all organisms, hydrolyze the interior α-1, 4-glucosidic bonds of starch (both amylose and amylopectin), glycogen, and cyclodextrins with retention of the α-configuration of the anomeric carbon. Since the enzyme is *endo*-splitting, its action has a major effect on the viscosity of starch-based foods, such as puddings, cream sauces, etc**.**

8. **What are the undesirable actions of lipoxygenase in foods?**

Ans. The major undesirable actions of lipoxygenase in food are (a) destruction of chlorophyll and carotenes, (b) development of oxidative off flavors and aromas, often characterized as hay like, (c) oxidative damage

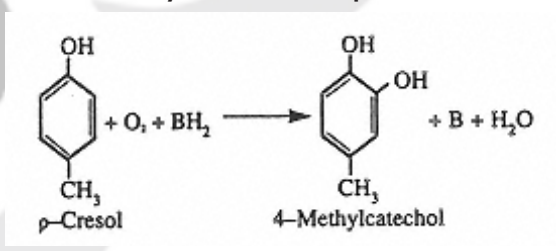
to compounds such as vitamins and proteins, and (d) oxidation of the essential fatty acids, lineoleic, linolenic, and arachidonic acids.

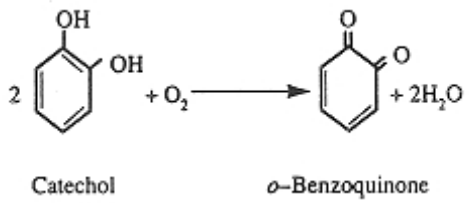
9. **Describe different enzymes used in tenderization of meat?**

Ans. The effect of proteases in the tenderization of meat is perhaps best known and is economically most important. After death, muscle becomes rigid due to rigor mortis (caused by extensive interaction of myosin and actin). Through action of endogenous proteases (Ca^{2+}-activated proteases, and perhaps cathepsins) on the myosin-action complex during storage (7–21 days) the muscle becomes more tender and juicy. Exogenous enzymes, such as papain and ficin, are added to some less choice meats to tenderize them, primarily due to partial hydrolysis of elastin and collagen.

10. ***What is the role of polyphenol oxidase in fruits and vegetables?***

Ans. Polyphenol oxidase (1,2-benzenediol:oxygen oxidoreductase; EC 1.10.3.1) is frequently called tyrosinase, polyphenolase, phenolase, catechol oxidase, cresolase, or catecholase, depending on the substrate used in its assay or found in the greatest concentration in the plant that serves as a source of the enzyme. Polyphenol oxidase is found in plants, animals and some microorganisms, especially the fungi. It catalyzes two quite different reactions with a large number of phenols.





The 4-methyl-*o*-benzoquinone is unstable and undergoes further non-enzyme-catalyzed oxidation by O_2, and polymerization, to give melanins.

11. ***What are amylases and name different types?***

Ans. Amylases, the enzymes that hydrolyze starches, are found not only in animals, but also in higher plants and microorganisms. Therefore, it is not surprising that some starch degradation occurs during maturation, storage, and processing of our foods. Since starch contributes in a major way to viscosity and texture of foods, its hydrolysis during storage and processing is a matter of importance. There are three major types of amylases: α-amylases, β-amylases, and glucoamylases. They act primarily on both starch and glycogen.

12. **Describe the role of enzymes in nutritional quality of foods?**

Ans. There is relatively little data available with respect to the effects of enzymes on nutritional quality of foods. Lipoxygenase oxidation of linoleic, linolenic, and arachidonic acids certainly decreases the amounts of these essential fatty acids in foods. The free radicals produced by lipoxygenase-catalyzed oxidation of polyunsaturated fatty acids decrease the carotenoid (vitamin A precursors), tocopherols (vitamin E), vitamin C, and folate content of foods. The free radicals also are damaging to cysteine, tyrosine, tryptophan, and histidine residues of proteins. Ascorbic acid is destroyed by ascorbic acid oxidase found in some vegetables such as squash. Thiaminase destroys thiamine, an essential cofactor involved in amino acid metabolism. Riboflavin hydrolase, found in some microorganisms, can degrade riboflavin. Polyphenol oxidase-caused browning decreases the available lysine content of proteins.

13. **What are the desirable traits of lipases in processed foods?**

Ans. Enhancing flavor development and shortening the time for cheese ripening. Used for production of specialty fats with improved qualities. Used for production of enzyme-modified cheese/butter from cheese curd or butterfat.

14. **What is the role of peroxidase in food processing?**

Ans. Peroxidase, a relatively heat-resistant enzyme not usually associated

with development of defects in food, is generally used as the indicator for adequate heat treatment of these foods. It is clear now that a higher quality product can be produced by using the primary enzyme involved in off flavor and off aroma development as the indicator enzyme.

15. **Name the enzyme used for reducing bitter taste in grapefruit juice?**

Ans. Naringin is responsible for the bitter taste of grapefruit and grapefruit juice. Naringin can be destroyed by treating the juice with naraginase.