INFORMATION SHEET

ENZYMES AS BIOCATALYSTS

Catalysts – substances which speed up the rate of chemical reactions without being used up in the reaction.
Enzymes – protein molecules which catalyse chemical reactions (biocatalysts).
Catalase – an enzyme which breaks down the poisonous substance hydrogen peroxide (which is formed in both plants and animals) to water and oxygen.

CATALASE

Catalase occurs in the cells of many living organisms. Hydrogen peroxide is a substance which is produced as a result of normal metabolic processes in healthy living cells of seeds. It is toxic to living cells if it is allowed to accumulate in the tissues of living organisms. Catalase acts on the substrate hydrogen peroxide and converts it into water and oxygen as follows:

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

Catalase is responsible for speeding up this important reaction which would otherwise be too slow to support life. Catalase is found in cell organelles called peroxisomes. One molecule of catalase can convert six million molecules of hydrogen peroxide to water and oxygen each minute. The rate at which the enzymes work is influenced by several factors, such as concentration of the substrate (hydrogen peroxide), temperature, pH and the presence of inhibitors or activators.

Each different enzyme has an optimal range for each of these factors at which the enzyme activity is at its maximum. Temperatures in excess of 40 ºC will denature (destroy) the catalase enzyme and make it useless. Boiling an enzyme would therefore denature it completely.

TESTING FOR OXYGEN

You may remember learning how to test for the presence of oxygen from your Natural Sciences lessons in Grade 8 and Grade 9.

The simple test involves plunging a glowing piece of wood (called a splint) into a test tube. If the gas in the test tube contains oxygen, the splint will relight and burn with a bright flame.

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