

Name: _____ Date: _____ Period: _____

Factors that Affect Enzyme Activity

Wk# _____

Directions: Analyze Figure 1 and answer the corresponding questions.

1. Point A: _____

2. Point B: _____

3. Point C: _____

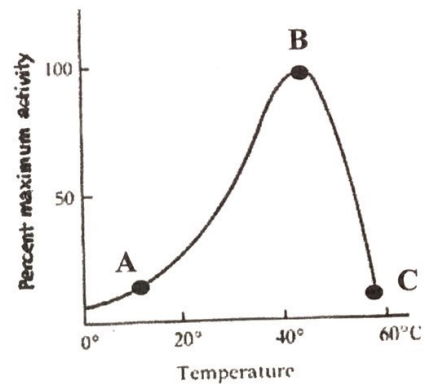


Figure 1

Most of the chemical reactions that take place within a cell involve protein called **enzymes**. Enzymes speed up the rates of chemical reactions. They do so by binding reactants, or **substrates**, and holding them in a particular position that maximizes the chances that a particular chemical reaction will occur, converting the substrates into **products**. The ability of enzymes to function depends upon the shape of the protein. The specific shape of enzymes enables precise control over the chemical processes taking place inside the cell.

The ability of an enzyme to convert substrate into product is referred to as **enzyme activity**. At higher temperatures, particles tend to be moving more quickly than they are at slower temperatures. When particles are moving more quickly, they tend to collide with one another more frequently and with greater energy. Therefore, the rates of chemical reactions tend to increase as temperature increases. The exception to this is very high temperatures. The increase in temperature weakens and destabilizes the enzymes which results in the shape of the enzyme being altered. When enzymes experience a change in shape, it is said that the enzyme **denatures**, and is no longer able to function properly.

Figure 2 illustrates the enzyme activity under optimum conditions. In Figure 3, illustrate the same enzyme's activity when the optimum temperature has been exceeded. (In each figure label enzyme, substrate, active site, and products.)

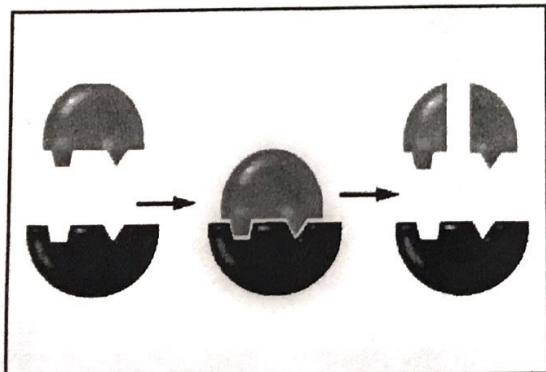


Figure 2

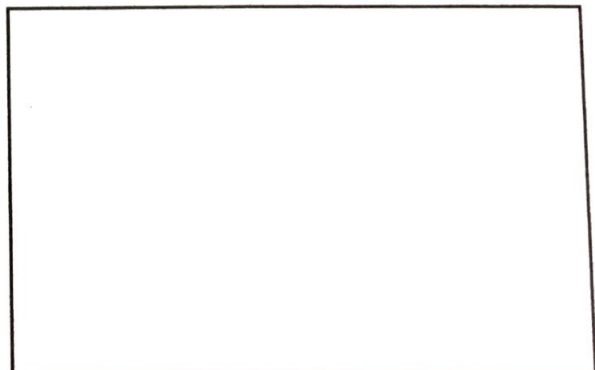


Figure 3

Name: _____ Date: _____ Period: _____

The Bromelain Enzyme

Have you ever noticed the side of a Jello box before?
Take a look now:

You can add fruit or vegetables to Jello, but you cannot add "fresh or frozen pineapple, kiwi, ginger root, papaya, figs, or guava" because the gelatin will not set or solidify. While many have noticed this warning, few have wondered why. We will learn why we cannot use these types of fruit in Jello by conducting an experiment.

To Add Fruit or Vegetables:
REFRIGERATE dissolved gelatin 1-1/2 hours or until thickened. Stir in 3/4 cup to 1-1/2 cups chopped fruit or vegetables (well drained, if using canned).
REFRIGERATE 4 hours or until firm.
NOTE: Do not use fresh or frozen pineapple, kiwi, gingerroot, papaya, figs or guava. Gelatin will not set.

All the fruits listed on the warning label contain an enzyme called bromelain. Bromelain, found naturally in the fruit, is a protein-digesting enzyme. This means that bromelain breaks proteins into individual amino acids. Jello is made from gelatin, which is a protein.

1. Based on the information above, why does pineapple prevent Jello from setting or become a solid?

2. Why do you think the makers of Jello specifically warned against using "fresh or frozen pineapple"?

3. When fruit is canned, it undergoes a process where it is heated to kill bacteria and then sealed in a can. Why is it possible to use canned pineapple in Jello but not fresh pineapple?

