# Heating and cooling curve of water essay sample

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Gelatine is a clear, colorless, brittle (when dry), flavourless solid substance, derived from the collagen inside the skin and bones of animals. Substances containing gelatine or functioning in a similar way are called gelatinous. gelatine is an irreversibly hydrolysed form of collagen. It is found in some gummy candies as well as other products such as marshmallows, gelatine dessert, and some low-fat yogurt. Household gelatine comes in the form of sheets, granules, or powder.

Proteins are essential nutrients for the human body. They are one of the building blocks of the body, but can also serve as a fuel source. Proteins are polymer chains made of amino acids linked together by peptide bonds. In nutrition, proteins are broken down in the stomach during digestion by enzymes known as proteases into smaller polypeptides to provide amino acids for the body, including the necessary amino acids that cannot be biosynthesized by the body itself.

Biosynthesis is an enzyme-catalyzed process in cells of living organisms by which substrates are converted to more complex products.

Collagen is a group of naturally occurring proteins found in animals, especially in the flesh and connective tissues of mammals. It is the main component of connective tissue, and is the most plentiful protein in mammals. The fibroblast is the most common cell which creates collagen.

A protease is any enzyme that conducts proteolysis, that is, begins protein catabolism by hydrolysis (the chemical breakdown of bonds due to the reaction of water) of the peptide bonds that link amino acids together in the polypeptide chain forming the protein.

Denaturation is a process in which proteins or nucleic acids lose the tertiary structure and secondary structure which is present in their native state, by application of some external stress or compound such as a strong acid or base, a concentrated inorganic salt, an organic solvent, or heat.

A protease is a protein and like all proteins has a precise 3-D shape resulting in part, from the interactions and bonding between the amino acids which make up the protein. Part of the enzyme molecule has a specific 3-D shaped active site where the substrate binds and reactions occur. This active site is specific for the substrate which fits, like a lock and key, with the enzyme. In the case of proteases the active site shape is specific for amino acids and peptide bonds of the protein substrate which allows the specific reactions – hydrolysis of proteins – to occur.

gelatine is a form of collagen that has undergone a chemical reaction to change it slightly and make it able to solidify when you’re cooking with it. When you’re making a gelatine dessert, you dissolve the gelatine mix in water. The gelatine proteins are like microscopic strands. These long, thin, flexible gelatine proteins tangle up with one another. As the gelatine proteins tangle, they form mesh pockets that trap the water, sugar, and other flavoring agents that you’ve added to your dessert.

What happens when you add fruit to your gelatine? Some fruits, like strawberries, oranges, and apples, are a tasty addition; the gelatine solidifies around the chunks of fruit. But if you add fruits like pineapple, guava, mango, or kiwi, you end up with a runny mess that never solidifies. It turns out that this second group of fruits all contain proteases, like papain and

bromelain. Proteases are a special class of protein that act like a pair of scissors, cutting other proteins up.

First you'll see for yourself whether one of these protease-containing fruits interferes with gelatine's ability to solidify. If it does, you'll test whether it is the protease that interferes with solidifying by inactivating the protease in the fruit and then adding the fruit to the gelatine. Proteases, like papain and bromelain, are also proteins themselves. Most proteins can be inactivated using a variety of methods. One such method is called denaturation. Denaturation changes the structure, or shape, of the protein, without changing what it is made up of. Exposure to heat is one method of denaturing proteins.

Certain fruit such as figs, ginger root, guava, kiwi, mango, papaya, and pineapple contain a plant enzyme called bromelain (type of protease) that breaks down proteins. Bromelain is used in many meat tenderizers for this purpose. Gelatine is a protein mesh with trapped pockets of liquid; the bromelain cuts the protein chains and keeps the gelatine from jelling properly.

Gelatine can not solidify when protease enzymes are present.

Fruits with protease – such as figs, ginger root, guava, kiwi, mango, papaya, and pineapple. Fruits without protease – such as apples, blueberries, oranges, raspberries, and strawberries.

Pineapple belongs to a group of plants called Bromeliads. Kiwi, papaya, and figs are other types of Bromeliads. The enzyme in pineapple juice that is

responsible for the breakdown of collagen is bromelin. The process of canning pineapple denatures the bromelin, rendering it incapable of catalyzing the break down of gelatine.

Scientific Method

Investigation Question:

Do certain fruits contain enzymes that prevents gelatine from solidifying?

Aim:

To determine if some fruits contain enzymes that prevent gelatine from solidifying.

Hypothesis:

If different fruits are added to the gelatine, then the gelatine will continue to form a solid if refrigerated.

Prediction:

As the different fruit are added to the gelatine, the gelatine will continue to solidify as usual.

Variables:

Independent variable:

The type of fruit, containing different enzymes, added to the gelatine.

Dependant Variable:

The physical state (solid; liquid; gas) of the gelatine .

Fixed variables:

Other enzymes contained in fruit.

Temperature of the environment/refrigerator.

pH of water used on the experiment.

Mineral salt contained in gelatine.

Amount of gelatine used in each cup.

Amount of water used in each cup.

Amount of fruit added to the cups.

Time results are recorded.

Type of material apparatus is made from, e. g cups; spoons ect. Size of the cups.

Apparatus needed:

Clear plastic cups (15)

Permanent marker

Chopped fresh fruit (3 cups of each fruit you'd like to test); choose at least one fruit with protease and one fruit without protease. Knife

Cutting board

Teaspoon

Dry measuring cup

Cold and boiling water

Spoons for stirring (6)

Gelatin mix (enough to make 18 cups)

Method:

1. Label the 15 cups according to their contents. Each gelatine condition should have a #1, a #2, and a #3 cup. a. Plain gelatine: Total of three cups b. Raw pineapple : Total of six cups – three for the fruit with protease and three for the fruit without protease c. Cooked pineapple : Total of six cups – three for the fruit with protease and three for the fruit without protease 2. Cut up each of the fruits. Be sure to wash your cutting board and knife after you cut each fruit. 3. Cook 1½ cups of each type of fruit. Fruit should be either steamed or boiled for 5 minutes. Leave the other 1½ cups raw. 4. Add approximately ½ cup of fruit (cooked or raw) to each of the plastic cups that are labeled as containing fruit. 5. Make the gelatine according to the package instructions. Add 1 cup of gelatine liquid to each of the plastic cups. Using a spoon, thoroughly stir the contents of each cup. Make sure to use a different spoon for each condition. Refrigerate all of the cups.

Check the consistency of the gelatine in each cup at regular intervals (once or twice an hour). Record all your observations.

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