

Heat and Yeast - Student Worksheet

Life Depends on Enzyme Activity to Survive



Most living things depend on chemical reactions within their bodies to release energy for growth, movement, repairing damage and reproduction. Enzymes are biological catalysts. They accelerate the speed of necessary reactions without being used up. Because enzymes are proteins they only work effectively between narrow ranges of temperature. Most human enzymes work best about 37°C and our bodies work hard to maintain that as a core temperature. If we become too hot or too cold our efficiency is affected. Without enzymes we die. This is the same for most "warm blooded animals".

Yeasts are simple fungi. They are single cells about $3/1000$ ths of a metre long that divide to create new cells and for that and any other process, they need energy. Their energy comes from breaking down food such as sugars and complex carbohydrates just like us. During the process of respiration (creating energy) carbon dioxide gas is released.



Different varieties of yeast are used for brewing beer, making wine and baking bread.

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To make bread, flour is mixed with sugar, water and yeast to form resilient dough, which is then kneaded. Kneading mixes water with protein in the flour to form long elastic strands. The dough is left in a warm place so that escaping carbon dioxide from the yeast and sugar reaction is trapped within this elastic dough. When it has risen, the dough is placed into a hot oven. The yeast and its enzymes are killed by heat but the bubbles of gas remain trapped by cooked bread.

We cannot produce and eat food in Science rooms, so we will only observe part of this reaction.



The rate of reaction depends on temperature. The experiment pictured above was carried out when the temperature inside was 26°C and outside 37°C. The glass was left outside for 3 minutes.

If the temperature is too hot the enzymes stop working.

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Activity: To observe the effect of heat from the Sun on yeast enzyme efficiency

Materials

- Two glasses or beakers of the same size.
- One warm sunny location and one cool location.
- 2 half tablespoons of sugar.
- 2 teaspoons of dried yeast.
- Tepid water. Tepid water is about the temperature of your elbow.
- Teaspoon, tablespoon, pop stick to stir the mix.

Method

1. Measure the temperature inside and outside in the heat of the Sun.
2. Half fill both containers with tepid water. Dip your elbow in the water to check it is the correct temperature.
3. Dissolve 1 teaspoon of sugar in each container.
4. Sprinkle 1 tablespoonful of dried yeast on top of the water then stir to dissolve it.
5. Place one container in a sun warmed area and the other in a shaded cool part of the classroom.
6. Observe changes in the two mixtures.
7. Write and draw your observations in the table provided.
8. While you are waiting and watching answer the last question on how humans use the Sun's heat.



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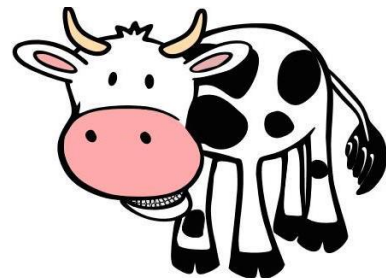
Location	Inside	Outside
Start		
After 3mins		
After 6 minutes		

Conclusion

Does energy from the Sun affect enzyme efficiency? _____

Explain your answer

Was this a good scientific experiment, a Fair Test? Did the cow moo softly?



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What one thing did we change?

What one thing did we measure?

Did we keep everything the same?

If we did the experiment again, what would we have to do to make it a good one?

What materials would we need to do this?



