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Assessment Title Anaerobic Reaction of yeast Date 06/17/01
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I am going to investigate the anaerobic reaction of Yeast. Anaerobic respiration requires:

Glucose $\Rightarrow$ Co_2+Alcohol.

Whilst Aerobic respiration, which we use to breathe, requires:

Glucose + Oxygen $\Rightarrow$ Co_2+H^20+ heat energy.

To observe and record results of this reaction I will measure the amount of Co_2 this experiment produces.

There are a number of variables I need to consider beforehand that could dramatically affect my experiment. I have also made predictions where appropriate
Temperature
This can make the rate of reaction speed up or slow down. It will noticeably slow down the reaction when the water is cooled. But the Yeast will speed up until a point where it cannot survive anymore.
I would expect my graph to show the Yeast speeding up and then dying.

As I heat the water, the particles start to move faster, this makes them collide at a faster speed, speeding up the rate of reaction.

Amount of Yeast
I will keep the amount at a constant by using a test-tube to measure out an exact amount. If I added too much yeast it would be more too react with the Co_2, this would slow down the particles and they would all be used up. As the amount of yeast increases there is more particles to collide with, and this would also use up all the

glucose.

Osmosis (osmosis occurs when glucose is added)
The diffusion of solvent particles through a selectively permeable membrane from a region of high solvent concentration to a region of lower solvent concentration. These membranes have tiny pores, which allow rapid passage of small water particles, but restrict the passage of larger solute particles. Since the membrane is selectively permeable, osmosis is important in the passage of water into and out of cells and organisms, the speed depends on osmosis pressure. I predict that the more heat that is applied to this the faster this reaction happens.
I have chosen to investigate the variable of temperature and test it from temperatures from 20-80 degrees. I think seriously about my prediction of the speeding up and slowing down reactions, temperature can cause.

Glucose
When we add more glucose there are more particles to collide with at first, then the solution on the outside of the yeast becomes concentrated so water moves out of yeast by osmosis and the yeast dehydrates.

Water
If the mount of water increases effectively it will reduce the concentration so there are less collisions.

Safety
I will wear a lab coat and be really careful with any hot – waters that I will handle.

Apparatus
The apparatus that I will use will be:
1 beaker, 1trough, 1 kettle (to obtain water), 1 measuring tube, 1 thermometer and 1 tube and bung.
For each experiment I will use $10cm^3$ of the stock solution. The solution is 20g of yeast, 20g glucose and $200cm^3$ of water.

Method

I will:
- Fill the water bath with water that has been put to a certain temperature
- Get a boiling tube and put $10cm^3$ of solution in it
- Put a bung and pipe in the end
- fill the beaker with water to the right temperature
- Fill graduated tube water
- Put the tube into the test-tube
- Put the boiling tube in the beaker
- Leave for 3mins to get to temperature
- Time for 5mins
- Measure amount of Co_2 produced.
- Then I will alter to a different temperature in this case my temperature is altering 10 each time so I will use the kettle to alter this temperature making sure it is the right

temperature by using a thermometer.
♦I will use the same amount of yeast for each 'run' to eliminate solution variation.

As I am obtaining these results, I will make sure I use the correct amount of ingredients and make sure I keep my variables (i.e. amount of yeast the same throughout experiment) to what I have predicted they should stay at in experiment.

I will record my results in a table as underneath, but I may need to repeat some results, if they look out of place when compared to my results or conclusion.

Temp	Time	Run1 (cm)	Run2 (cm)	Average (cm)
20	5mins			
30	5mins			
40	5mins			
50	5mins			
60	5mins			
70	5mins			
80	5mins			

Obtaining evidence
After I conducting my experiment to record my results, I found that out that the yeast speeded up from 30 to 50 but then slowly started to deplete from 50 -70 and then it died at 80.

Temp	Time	Run1 (cm)	Run2 (cm)	Average (cm)
20	5mins	0	0	0
30	5mins	1	1	1
40	5mins	5.5	5.5	5.5
50	5mins	6.5	6.5	6.5
60	5mins	5	5	5
70	5mins	1.5	1.2	1.4
80	5mins	0	0	0

For my experiment I was very careful in handling the hot water, but I was also very careful about the amount of water, which I added, because I needed to keep that at a constant.

Analyses

As I can see from my graph, the amount of Co_2 being produced starts to increase till about 50 degrees where it reaches it reaches its peak after the yeast starts to die. As explained in my plan under variables and prediction I have discovered that when I heat the yeast it speeds up until it gets to a point where the particles starts to die off because of the temperature gets too hot for the enzymes to function and breath properly so they can not work at this temperature which slowly kills them. Because enzymes cannot function past a certain temperature (past 50 degrees in this case) but they do speed up when heated to a controlled amount under this temperature. My prediction is backed up by the evidence that I have gained from my Obtaining evidence. Take heat for example my chosen variable; as predicted in planning it did increase the speed of the reaction, when I heated the yeast e.g. From 1 to 5.5 in just altering it by 10 degrees from 30 to 40.

Evaluation

I think the procedure I used was a reliable and efficient method in testing for Co_2 in the anaerobic respiration of yeast. The results matched my prediction and I think it was right to repeat each test twice to pin point any rogue result if there is one.
I think that I can form the conclusion that 'the yeast can only perform anaerobic respiration past a certain temperature (20) and under a certain temperature (80)'. As temperature was my chosen variable to alter and measure this is what I have discovered. I think if I could extend my study of this I could make changes to keep in my experiment set up to keep nearly all my variables at a constant, e.g. I could use a more reliable source of heating the water other than a kettle, this would greatly improve the reliability of the experiment, I may get more accurate and even better results than I have now by taking recordings of the Co_2 in the yeast every 5 degrees, this would give me a better indication of whether the results are on course to being accurate and I could have a better chance at pin pointing when Co_2 stops being produced. I think I experiment was a success I have spotted when the yeast stops anaerobically reacting and when it starts anaerobically reacting. I have found out that the enzymes in the yeast start to rapidly speed up when they are heated but too much heat will kill them as we have seen in my experiment.

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