Rishul Shah 10B

Experiment to show the factors that effect the respiration in yeast

Introduction

Yeast is a single celled fungus. It respires anaerobically (the release of energy from glucose, without combining it with oxygen). When this is done it converts sugar to ethanol. Yeast is one of the living cells which can respire without oxygen anaerobically by reacting with a sugar solution such as glucose to produce carbon dioxide and ethanol and a small amount of energy. When the conversion of sugar to ethanol and carbon dioxide it is known as fermentation. The energy formed is necessary for the yeast to carry out the reactions necessary for cell growth. Yeast cell replicates fastest at about forty-two degrees Celsius.
The variable I have used to carry out this experiment is Temperature
Equation: Glucose -> alcohol + carbon dioxide + energy

Prediction

I predict that in my bubble count the number of bubbles will increase gradually as the temperature increase up to sixty-two degrees Celsius because the yeast will respire faster at a higher temperature. At 27 degrees Celsius the yeast will give off Carbon dioxide because the temperature is to low and it is not high enough to form a reaction but between 32 degrees Celsius and 47 degrees Celsius a large amount of Carbon Dioxide we be given off. The number of bubbles made will decrease when the temperature is higher then fifty degrees Celsius because the heat from the water will start to denature the yeast cells. I think that once the temperature has raised over sixty degrees Celsius no bubbles will be produced because the water will be to hot for the yeast, therefore the heat from the water will denature the yeast and no respiration will able to take place.

Preliminary Test

The quantities of materials I have used are:
100cm3 of cold water, 50cm3 of kettle water
10% glucose
10% yeast

The glucose solution and the yeast solution used are fully concentrated. I timed the amount of oxygen gas coming out of the Boiling Tube and through the delivery tube and out of the test tube, forming bubbles for 1minute. I repeated this 3 times and my results show that the amount of bubbles has risen.

I will measure the rate of respiration in yeast by counting the number of bubbles produced within one minute at different temperatures. I will make sure the yeast and glucose solution has been left for at least ten minutes to settle to the temperature before starting to count the bubbles. The amount of yeast will be kept the same as the amount of glucose, 10cm3 of yeast and 10cm3 of glucose. The only thing that will change is the temperature. The temperature range I have used ranges from 27 degrees Celsius to 47 degrees Celsius.

Rishul Shah 10B

Outline Plan

Fair Testing

Fair testing is that you make sure that all substances are out in with the same amount. To do a fair test for this experiment you must have these substances listed below at the same amount:

Same amount of suspension of yeast in cooled, boiled Glucose solution.
10% yeast
10% glucose

In the beaker a water bath of 37 degrees Celsius is needed. The boiling tube is then inserted into the beaker.

Range of Measurements

The method I am going to use is bubble count

100cm3 of cold water, 50cm3 of kettle water
10% glucose
10% yeast

Accuracy

I will repeat each measurement at least 3 times

Safety

To make sure that the kettle of water does not get knocked over and make sure that water does not spill on the Electricity

List of Apparatus

Test Tube
Delivery tube
Beaker
Boiling tube
Stop clock
Measuring cylinder

Rishul Shah 10B

Detailed Method

1. Firstly you pour 10% of Yeast solution from the beaker into the measuring cylinder.
2. You then poured the Yeast solution from the measuring cylinder into the delivery tube.
3. Next I Pour 10% of Glucose solution from the beaker into the measuring cylinder.
4. Then you pour the Glucose solution from the measuring cylinder into the delivery tube.
5. Once you have done that you pour 5% of water into the test tube
6. Next you create a water bath using 100cm3 of tap water and 25cm3 of boiling kettle water to form 27degrees Celsius.
7. After that you connect the delivery tube to the boiling tube with the rubber bung going into the boiling tube and the glass end going into a test tube.
8. You then start your stop clock and leave it running for 10minutes waiting for the yeast and glucose solution to react and form carbon dioxide which should then form bubbles.
9. You then count the amount of bubbles formed within one minute.
10. When you have completed those following steps you repeated them three times for each temperature. You use these eight different temperatures which are: 27, 32, 37, 42, 47, 52, 57, & 62 degrees Celsius.

Diagram to show the method used

Rishul Shah 10B

Results

Temperature (degrees Celsius)	Carbon Dioxide Bubbles within one minute			
	1	**2**	**3**	**Average**
27	4	4	5	9.67
32	9	10	10	22.33
37	22	24	25	54.33
42	44	47	48	107.00
47	63	67	70	153.33
52	15	14	17	15.33
57	13	11	14	12.6
62	No Bubbles formed			0

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Conclusion

Hydrogen Peroxide is broken down by peroxides in many organisms. Its catalytic results in the release of oxygen gas can be collected and is measured. The estimation of the oxygen release can be made by counting bubbles.

Equation: $2H_2O_2 \rightarrow 2H_2O + O_2$
Hydrogen Peroxide

The experiment uses the peroxides of yeast which is available without destruction of yeast cells. A yeast suspension works as the enzyme solution itself.

The concentration of hydrogen peroxide solution is sometimes measured by volume of oxygen that can be released from it.

Enzymes in Catalysts speeds up the reaction, but it is not changed at the end of a reaction therefore it can be re-used. Each enzyme has to take care of its own reaction, therefore its cell processes depends on specific enzymes. This makes the reaction process take place in the yeast experiment. The fermentation of glucose does not take place when yeast is not present. The yeast enzymes speed up the catalytic process.

The temperature of the reaction increases the rate of reaction, therefore the sugar and yeast in the test tube in the water bath is being tested. This is where the heat comes from. This shows how the yeast and glucose produces Carbon Dioxide. When the temperature is at a higher point the particles are moving faster, this is when they collide more often, which goes on to produce more reactions.

In conclusion I found out that the water in my water bath which set at 27 degrees Celsius was not hot enough for the yeast to produce many bubbles. At this temperature it only produced four to five bubbles within one minute. In the second testing of this temperature my results were similar, therefore my experiment was carried out accurately and very few errors were made. I also found out that after each minute the rate of reaction started speed up and double the amount of bubbles were produced.

The next temperature I applied was 32 degrees Celsius. I found out that when the temperature is higher the reaction takes place a lot quicker. This shows that a lot more Carbon Dioxide was generated and the amount of bubbles in the second experiment was almost doubled to the second amount from the first.

In the next temperature which is 37 degrees Celsius I found out that the amount of bubbles produced increased dramatically, this is because each time the temperature increases the rate of reaction increases therefore more bubbles are formed.

The next temperature I applied which is 42 degrees Celsius I found that the amount of bubbles produced was still increasing. This is because each time the temperature increases the rate of reaction increases therefore more bubbles are formed. 37 degrees Celsius is the optimum temperature. I say this because the yeast and glucose was respiring at a smooth pace.

The next temperature I used is 47 degrees Celsius. I found that the amount of bubbles produced started had come to a halt. From this point onwards the amount of bubbles started to decrease. This is because the yeast started to denature. This shows that the temperature is to hot for the yeast solution to cope at.

The next temperature I applied is 52 degrees Celsius. I found out that the number of bubbles had decreased dramatically. At 47 degrees Celsius there were 70 bubbles formed and at 52 degrees Celsius there were 14 bubbles formed.

The second to last temperature I tested was 57 degrees Celsius. At this point very few bubbles were formed. The amounts of bubbles formed were similar to the amounts formed at 32 degrees Celsius.

The last temperature I tested was 62 degrees Celsius. At this point there were no bubbles formed therefore the yeast had denatured.

Rishul Shah 10B

Evaluation

My results may not have been accurate as they should have been because sometimes the amount of bubbles being let of may have been released to fast and therefore they could not have been counted correctly and accurately.

Different batches of yeast which were used gave of different results in my experiment. The bubbles which were formed could have either been large or small, therefore the accuracy of my results may have reduced.

The Temperature of the climate outside can make my results vary. At different times of the day you can get different results because of the room temperature changing. e.g. Monday morning the experiment takes place, the room temperature is colder. Thursday afternoon the experiment continues, the room temperature is a lot warmer than the Monday morning.

The Timings of the experiment done can also effect my results because at different times of the day, the temperature of the yeast can be affected. This shows that errors have occurred.

All of the reasons given above evaluate what problems went wrong during my experiment.