Glow Stick And Temperature
Grade: 7th

Glow Sticks In Different Temperatures

ABSTRACT

My topic is Glow Sticks and Temperature.
This investigation involves very chemical concepts such as reaction rates and energy transfer by connecting classroom theory to visible, real world concepts, making it easier for learners to grasp abstract ideas through hands-on experimentation.
How do glow sticks change in different types of temperatures? How much time would each glow stick take?
If temperatures affect the change in color of glow sticks , then the ice glow stick will be the brightest.
First I took around 3 glow sticks of different colors and snapped the lights.
Then I will make observations on their glow, light level, and color.
I will later place the glow sticks in the containers with one container that has ice, the other container that has boiling water, and the last container normal tap water.
I will root set a timer and wait. When the color change is observed, then I will record the time.

HYPOTHESIS

If temperatures affect change in color of glow sticks, then the ice glow stick will be the brightest.

Science Research Question

How do glow sticks change in different types of temperatures? How much time would each glow stick take?

PURPOSE

This investigation reinforces core chemical concepts such as reaction rates and energy transfer by connecting classroom theory to visible, real world concepts, making it easier for learners to grasp abstract ideas through hands-on experimentation.

EXPERIMENTAL DESIGN

Independent Variable:
The different temperatures in which I are going to keep my glow sticks.
Dependent Variable:
How long the sticks stayed glowing. It was noted
Constants:
The amount of water and the glow sticks color.

PROCEDURE

- First I took around 3 glow sticks of different colors and snapped the lights.
- Then I will make observations on their glow, light level, and color.
- I will later place the glow sticks in the containers with one container that has ice, the other container that has boiling water, and the last container normal tap water.
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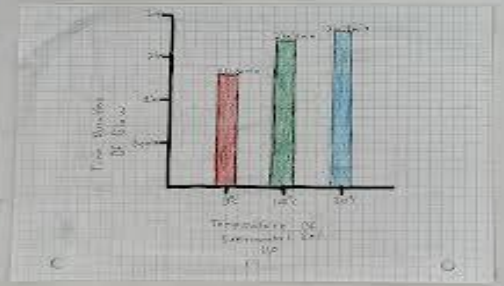


DATA TABLE

Temperature of Experimental Set Up	Time duration of glow	Characteristics Features
Ice very low or no water	1 hour 30 minutes	Noise from the glow stick started to happen, brightness diminished, very thick compared to others, etc.
Boiling water	2 hours 4 minutes	A lot of brightness, floating, very light, Glow stick looked very extended, etc.
Normal Tap Water	2 hours 9 minutes	Color change dissapeared, floats, noise happen, thick etc.

Data Collection

I knew was starting at 4 minutes with 11 seconds that's the glow stick. At 5 minutes and 30 seconds the outer of the glow stick in the ice is starting to get a bit more dark still making noise. I predict that the glow stick will change in 45-60 minutes. At 20 minutes with 36 seconds I took the water out of the containers from the started one. 35 minutes with 42 seconds is the same. Still big has changed just a little more water than the started one. The cold temperature slowed down the chemical reactions that produces the light (chemical measurement), reducing the molecules to move and collide less frequently. Exactly 1 hour 30 minutes and 56 seconds I took the glow stick out of the container and recorded that the glow stick looks very pink and has even brightness and just like making little pieces of ice. The boiling water glow stick immediately lit up the whole container. 2 minutes with 45 seconds the brightness is starting to become darker than the beginning. At 5 minutes 56 seconds the glow stick started to look a little bit patchy. At 6 minutes and 25 seconds I noticed that inside of the glow stick there is a part where there is no liquid, and has a color of very light purple. At 12 minutes and 15 seconds I observed that the glow stick is at the very down in the container it is keeped down it is not floating. The water has changed. It is still a little hot but not boiling hot. It has been 2 hours with 4 minutes and 23 seconds and I realized that the change was mainly in the brightness. The glow sticks brightness is rarely starting to change only in the edges in the middle it is still glowing a lot. At 16 minutes and 56 seconds I noticed that the glow stick is a floating so it will not stay down if you don't push it down. I predicted it is probably nearly because it is very glowing in the middle so all the volume of brightness is in the middle which makes the glow stick heavy. At 2 hours 4 minutes and 15 seconds the glow stick got thinner and I noticed the change.

LIMITATION

I should have tried the experiment with more variety of colors.

CONCLUSION

My conclusion was that the glow stick in ice will be the brightest, it did not work, I was not right. The boiling water glow stick was the brightest.

APPLICATION

Glow sticks are useful in disaster areas or places without power because they don't produce sparks, making them safe to use around potential gas leaks. They are regularly used by campers, divers, and military personnel for illumination in low-light conditions. The findings suggest that in cold environments, methods might be needed to keep the glow sticks warmer to ensure maximum brightness when needed.

Investigative Question/ Research Question

How do glow sticks change in different types of temperatures?
How much time would each glow stick take?

Hypothesis:

If temperatures affect change in color of glow sticks , then the ice glow stick will be the brightest.

Experimental Design:

Independent Variable:

The different temperatures in which I am going to keep my glow sticks.

Dependent Variable:

How long the sticks stayed glowing. It was noted.

Constants:

The amount of water and the glow sticks color.

Abstract

Glow Sticks and Temperature.

This investigation reinforces core chemical concepts such as reaction rates and energy transfer by connecting classroom theory to visible, real-world outcomes, making it easier for learners to grasp abstract ideas through hands-on experimentation.

How do glow sticks change in different types of temperatures? How much time would each glow stick take?

If temperatures affect the change in color of glow sticks , then the ice glow stick will be the brightest.

First I took around 3 glow sticks of different colors and snapped the lights.

Then I will make observations on their glow, light level, and color.

I will later place the glow sticks in the containers with one container that has ice, the other container that has boiling water, and the last container normal tap water.

I will next set a timer and wait. When the color change is observed, then I will record the time.

Materials Being Used :

Glow sticks, Containers, normal tap water, boiling water, and ice water.

Procedure :

First I will take around 3 glow sticks of different colors and snapped the lights.

Then I will make observations on their glow, light level, and color.

I will later place the glow sticks in the containers with one container that has ice, the other container that has boiling water, and the last container normal tap water.

I will next set a timer and wait. When the color change is observed, then I will record the time

Possible problems that might be faced while experimenting or while building your model:

Problems that could be faced while building my project could be that I could have inaccurate temperature measurements. And my subjective observation of brightness.

Proposed solution to the above problem:

Inaccurate temperature measurements can be solved by using the same thermometer. For my subjective observation of brightness I can solve the problem by standardizing distance, by maintaining a fixed distance between the glow sticks.

Scientific Vocabulary And Definitions

1. Chemiluminescence: Luminescence due to chemical reactions.

2. **Temperature: The degree of heat that is natural to the body of a living being.**

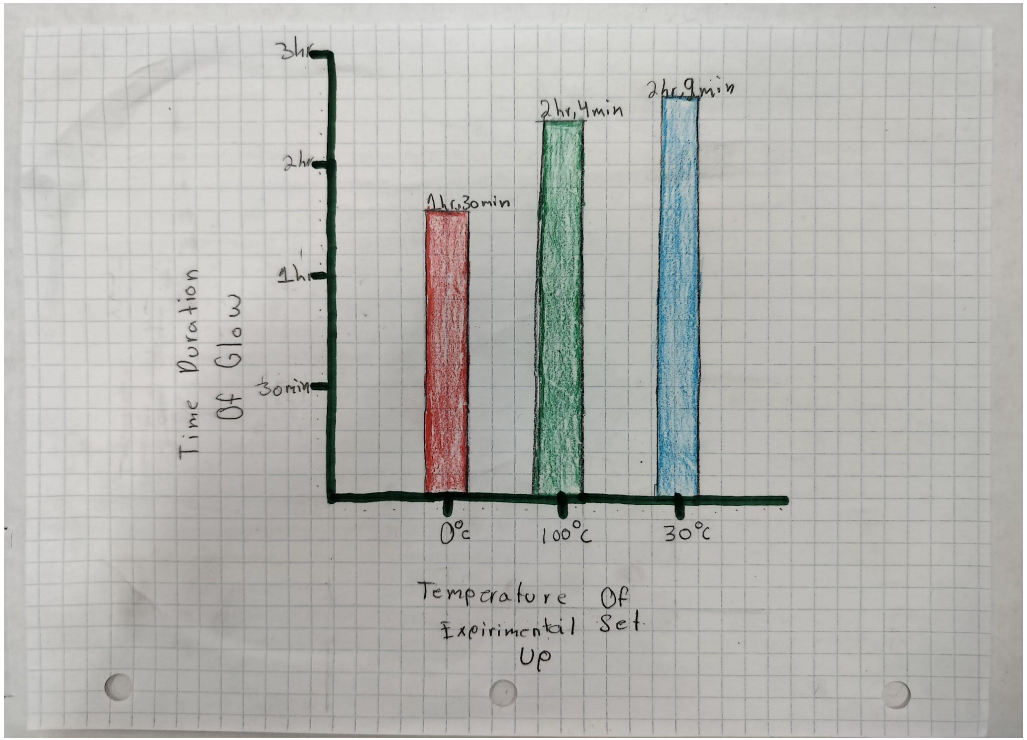
3. **Electrons: A subatomic particle that is found in all atoms.**

4. **Chemical Reaction: A chemical change that occurs when two or more substances combine to form a new substance**

Data Table

Temperature Of Experimental Set up.	Time duration of glow	Characteristic Features
Ice only ice no water.	1 hour 30 minutes	Noise from the glow stick started to happen, brightness, darkness, very thick compared to others. etc.
Boiling water.	2 hours 4 minutes	A lot of brightness, floating, very light, Glow stick looked very extended, etc.
Normal Tap Water.	2 hours 9 minutes	Color change, transparent, liquid inside freezed, thick, etc.

Graph


3hr
2hr
1hr
30min
Time Duration Of Glow
1hr,30min
2hr,4min
2hr,9min
0°c
100°c
30°c
Temperature Of Expirimental Set Up

Conclusion:

My conclusion was that the glow stick in ice will be the brightest ,it did not word. I was not right. The boiling water glow stick was the brightest.

Limitations:

I should have tried the experiment with more variety of colors.

Applications/ Future Research:

Glow sticks are useful in disaster areas or places without power because they don't produce sparks, making them safe to use around potential gas leaks.They are regularly used by campers, divers, and military personnel for illumination in low-light conditions. The findings suggest that in cold environments, methods might be needed to keep the glow sticks warmer to ensure maximum brightness when needed.

Research Summary:

The objective of this project is to investigate how temperature affects the brightness and duration of a glow stick's light. This phenomenon is an example of chemiluminescence, which is a chemical reaction that produces light energy without significant heat. A glow stick contains a solution with a fluorescent dye and an inner glass vial, allowing the chemicals to mix and react. The energy released from this reaction excites the electrons in the dye, causing them to emit light as they return to their normal state. Temperature significantly affects the rate of the chemical reaction, as described by the kinetic molecular theory. Increase the kinetic energy and speed of the molecules, leading to more frequent collisions. This speeds up chemical reactions resulting in a brighter glow for a shorter period as the reactants are consumed faster.

Early researchers and hobbyists have long investigated how environmental conditions change chemiluminescent reactions. For example, studies and informal experiments comparing glow stick performance at different temperatures consistently show that colder temperatures slow the reaction and extend glow duration, while warmer temperatures accelerate it and produce a brighter but shorter-lived light. Scientists explain these results using reaction-rate theory and consuming reactants faster, where lower temperatures reduce kinetic energy and slow the process. Prior work includes classroom investigations and published demonstrations of temperature effects on luminescent reactions and provides a strong methodology that you can adapt for controlled trials in this project.
The findings from this project have practical implications for both everyday use and scientific application: understanding how temperature alters the brightness and duration of glow sticks can help consumers choose when and how to use them safely (keeping them warm for short-term bright light or chilled for longer, dimmer illumination), guide event planners and emergency responders in storing and deploying chemiluminescent light sources effectively, and inform designers who develop longer-lasting or temperature-resistant chemiluminescent products. Additionally, this investigation reinforces core chemical concepts such as reaction rates and energy transfer by connecting classroom theory to visible, real-world outcomes, making it easier for learners to grasp abstract ideas through hands-on experimentation.

Bibliography

Source 1: https://www.education.com/activity/article/keep-light-sticks-lit-up-longer/

Source 2: https://littlebinsforlittlehands.com/glow-stick-experiment-chemiluminescence-science/