Lab Activity: Glow Stick Bioluminescence

A simple experiment showing how temperature affects glow reactions, just like enzymes do in living organisms.

Lesson Objective:

Students will model how luciferase (an enzyme) speeds up the bioluminescent reaction by observing how glow sticks react under different temperatures.

Materials (per group)

- 3 identical glow sticks
- 1 cup of **hot water** (not boiling — safe warm tap water is fine)
- 1 cup of **ice water**
- 1 cup of **room-temperature water**
- Timer or stopwatch
- Lab sheet (optional)

Procedure

1. Activate all three glow sticks at the same time. This represents the moment luciferin + oxygen + luciferase meet.

2. Place each glow stick in a different cup:

- **Hot water**
- **Room-temperature water**
- **Ice water**

3. Observe for 5 minutes.

Students record:

- Brightness
- Speed of glow change
- Any color differences
- How long the glow lasts

What Students Should See:

Hot water glow stick

- Glows brightest
- Reaction happens fastest
- Burns out quickly

Cold water glow stick

- Glows dimly
- Reaction is slow
- Lasts much longer

Room-temperature glow stick

- Medium brightness
- Medium reaction speed
- Medium duration

Activity Explanation:

Glow sticks use a chemical reaction — just like bioluminescent animals.

- **Hot water = enzyme working faster.** In real animals, luciferase speeds up the reaction so the glow is bright and quick.
- **Cold water = enzyme working slowly.** Without luciferase, the reaction between luciferin and oxygen would be slow and dim.
- **Room temperature = normal enzyme activity.** This models how most bioluminescent animals glow under normal conditions.