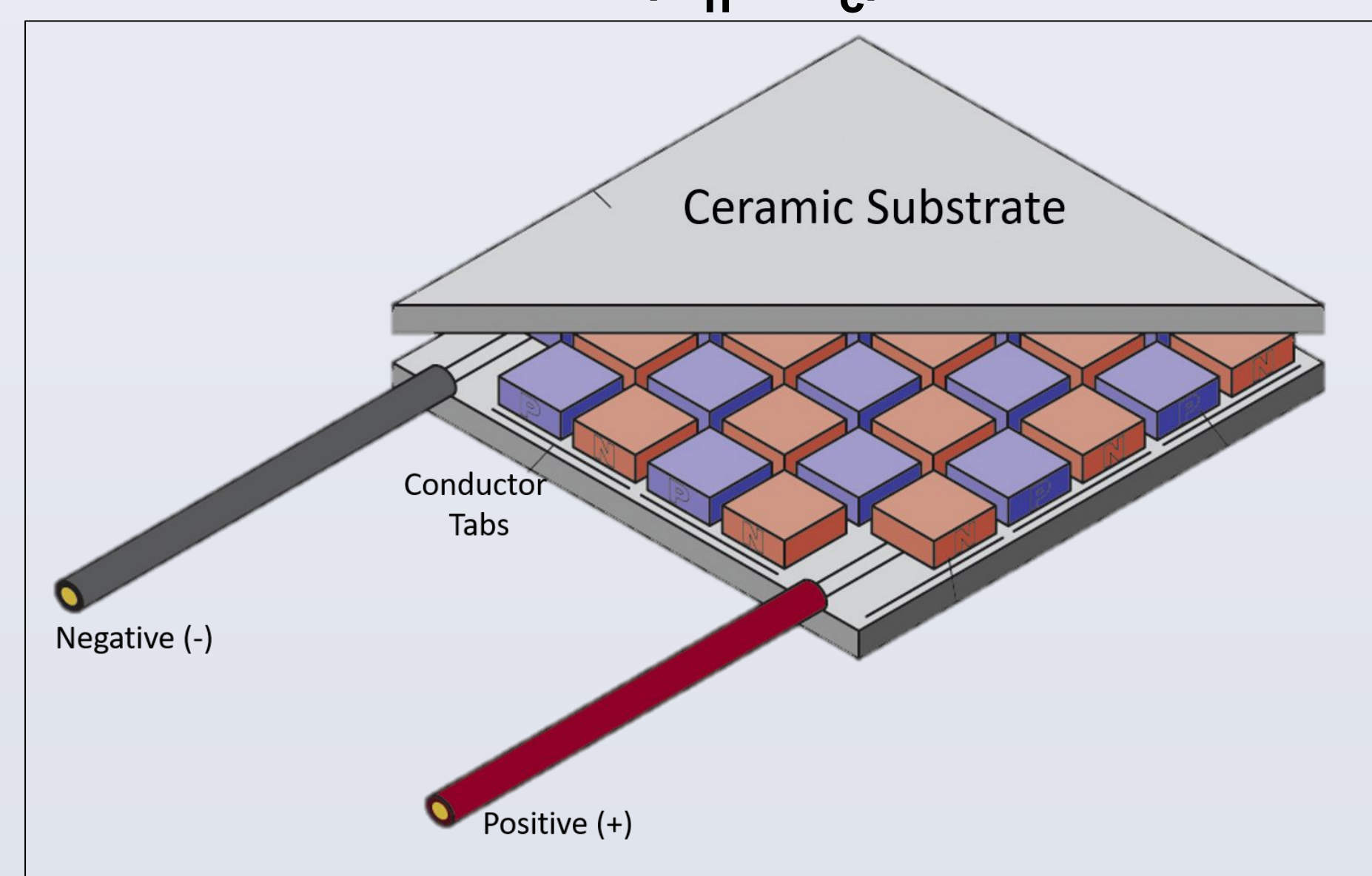


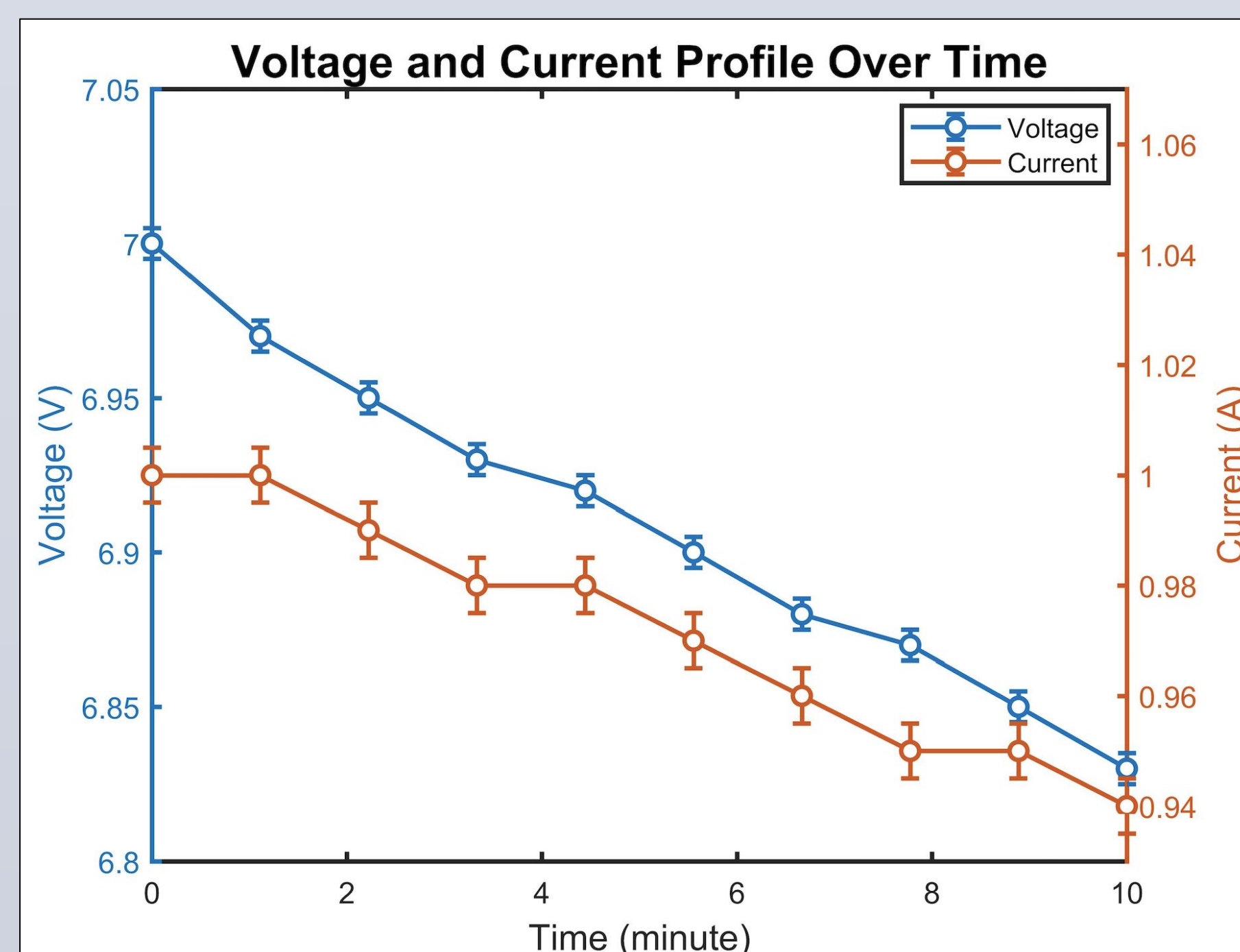
PROPULSION MECHANISM

The propulsion of the car is based on the **Seebeck effect**. In this process, two ends of an electrically conducting device will function at distinct temperature differences. Through the **flow in temperature**, an electromotive force is induced and an abundant **voltage source** is available.

$$V = a(T_h - T_c)$$



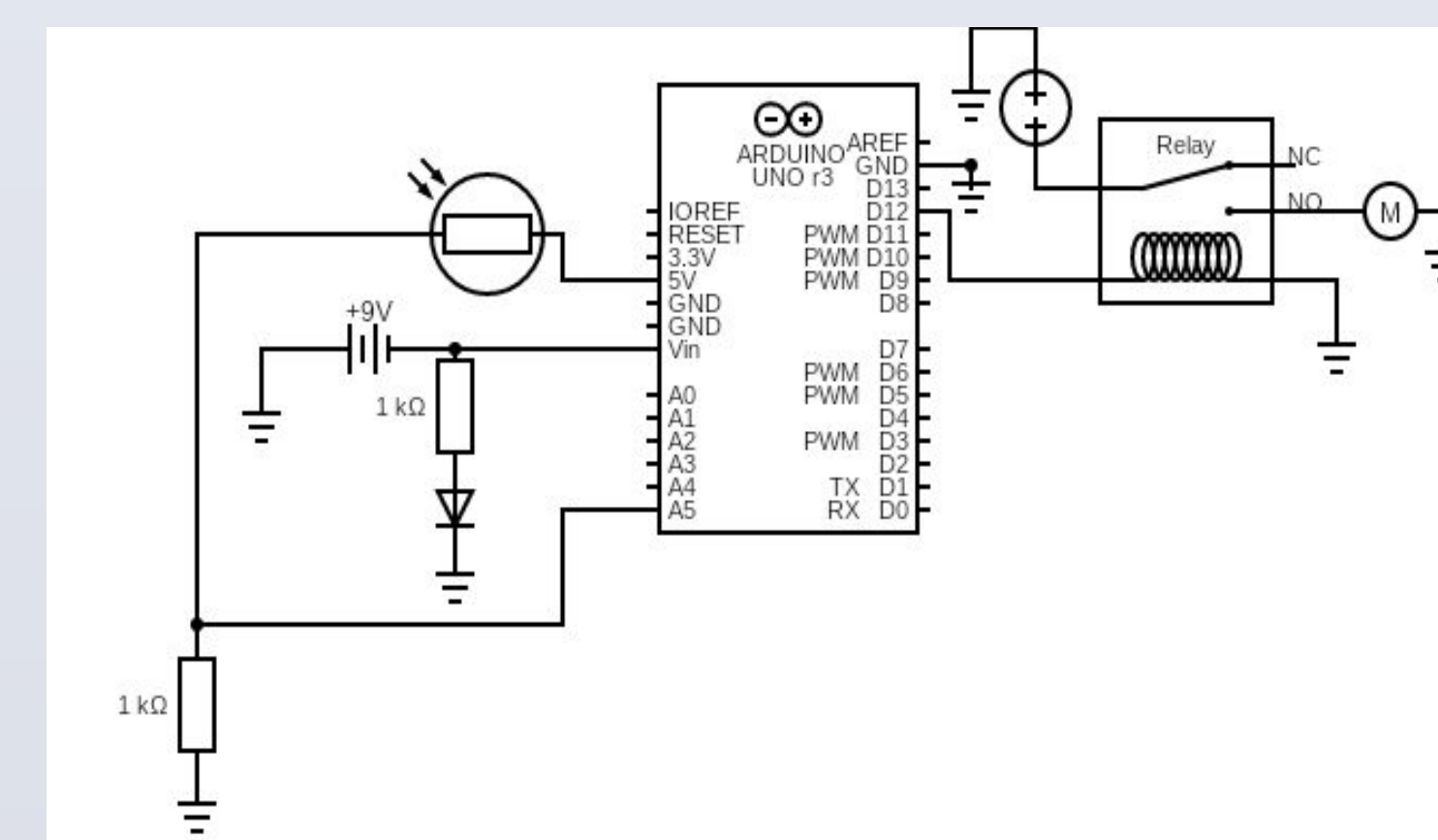
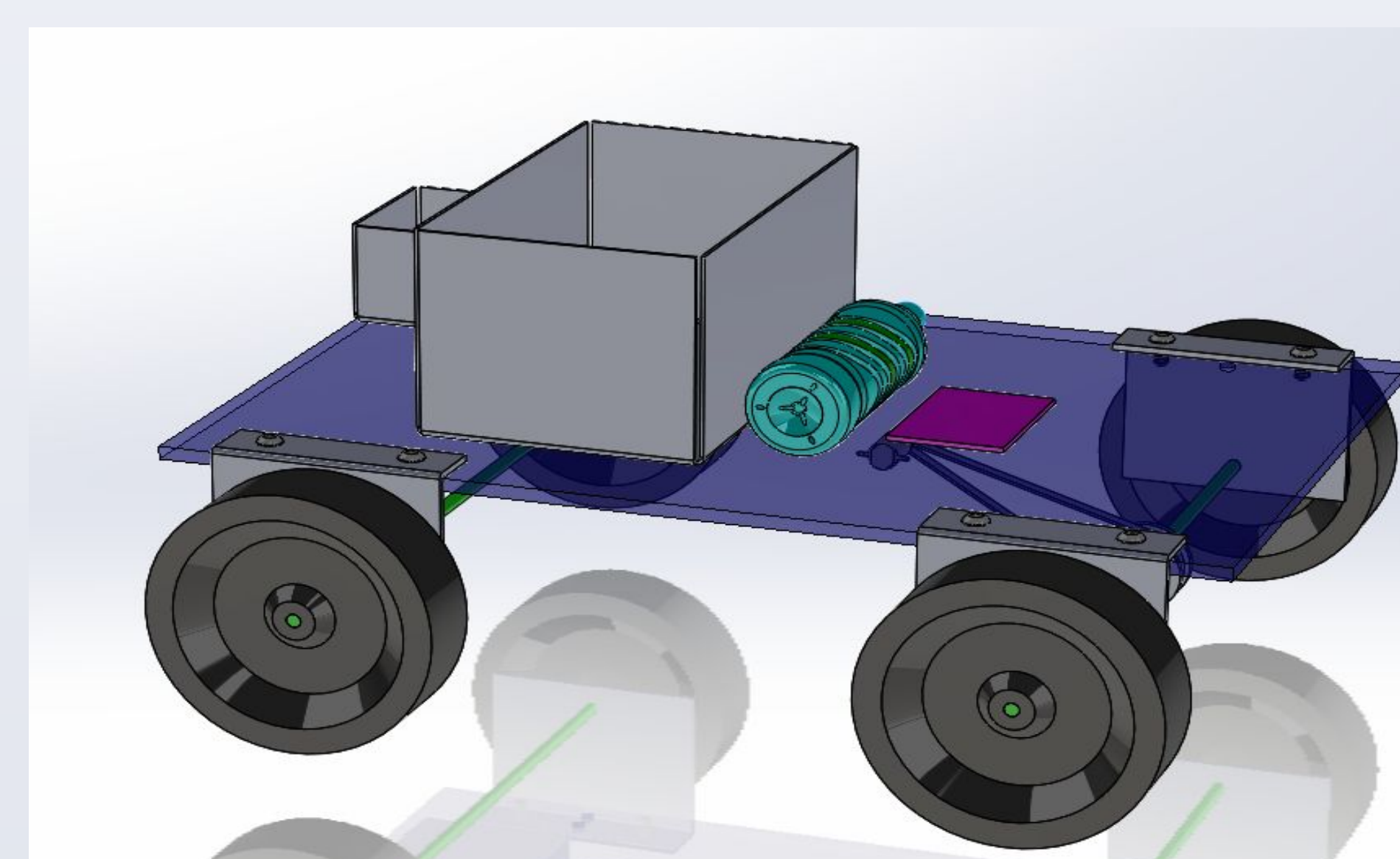
In order to generate the appropriate voltage and current, we will be utilizing a **thermal power source**. As displayed above, the device will be located between **boiling hot water and ice**. The hot water will be centered in a metal container with ceramic substrates along its frame and the ice will be adjacent to the substrates. Additionally, the entire generator will be insulated with **styrofoam** in order to exhibit adiabatic features.



VEHICLE DESIGN

UNIQUE FEATURES

- High traction wheels
- Secured axles to ensure consistent steering
- Lightweight acrylic frame
- Locking mechanism for all reaction compartments
- Easily accessible battery compartment
- Isolated motor to prevent electrical damage
- Average speed of 1.4 ft/s and weight of 7.2 lbs



CIRCUITRY

- 9 V battery, photoresistor, relay
- Part of the circuit is grounded to prevent short-circuiting
- Relay acts as a switch

ENVIRONMENTAL AND SAFETY FEATURES

ENVIRONMENTAL

- 3% H₂O₂ is accessible at any pharmacy
- Minimum friction allows for greater overall vehicle efficiency
- Most reactions can be **easily neutralized** and disposed of down the sink
- Sulfuric acid disposed of in acid waste container
- Starch mixtures disposed of in organic waste container

VEHICLE COST

- Total Cost of Car: **\$75**
- Cost per run
 - Propulsion - \$0.10
 - Stopping - \$0.25

SAFETY

- All chemicals handled with PPE and **properly disposed**
- Sulfuric acid handled with face shield and nitrile (+ rubber) double-layered gloves
- Thermal-resistant gloves used to **handle hot liquids**
- Double containment of all reactions **prevents spills**
- Insulated wiring **mitigates fire and electric shocks**
- Emergency switch **prevents physical hazards**

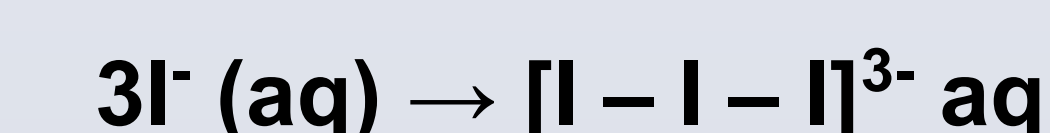
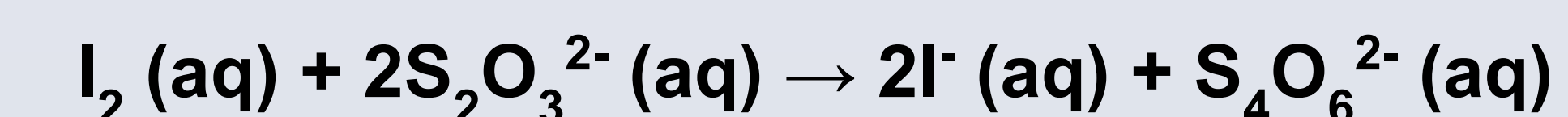
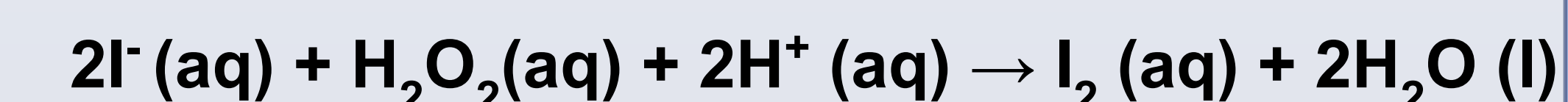


STOPPING MECHANISM

For our stopping mechanism, we will be utilizing an **iodine clock**. The iodine clock will be connected to an **Arduino** and involve a mixture of sodium thiosulfate, hydrogen peroxide, starch, and potassium iodide. The reaction rate will depend on the proportion of Potassium Iodide to Sodium Thiosulfate and the mixture will appear as a clear color. When the reaction exhibits a color change (dark purple), a **light dependent resistor** will signal the Arduino. This will stop the propulsion mechanism from moving the car.

REACTIONS

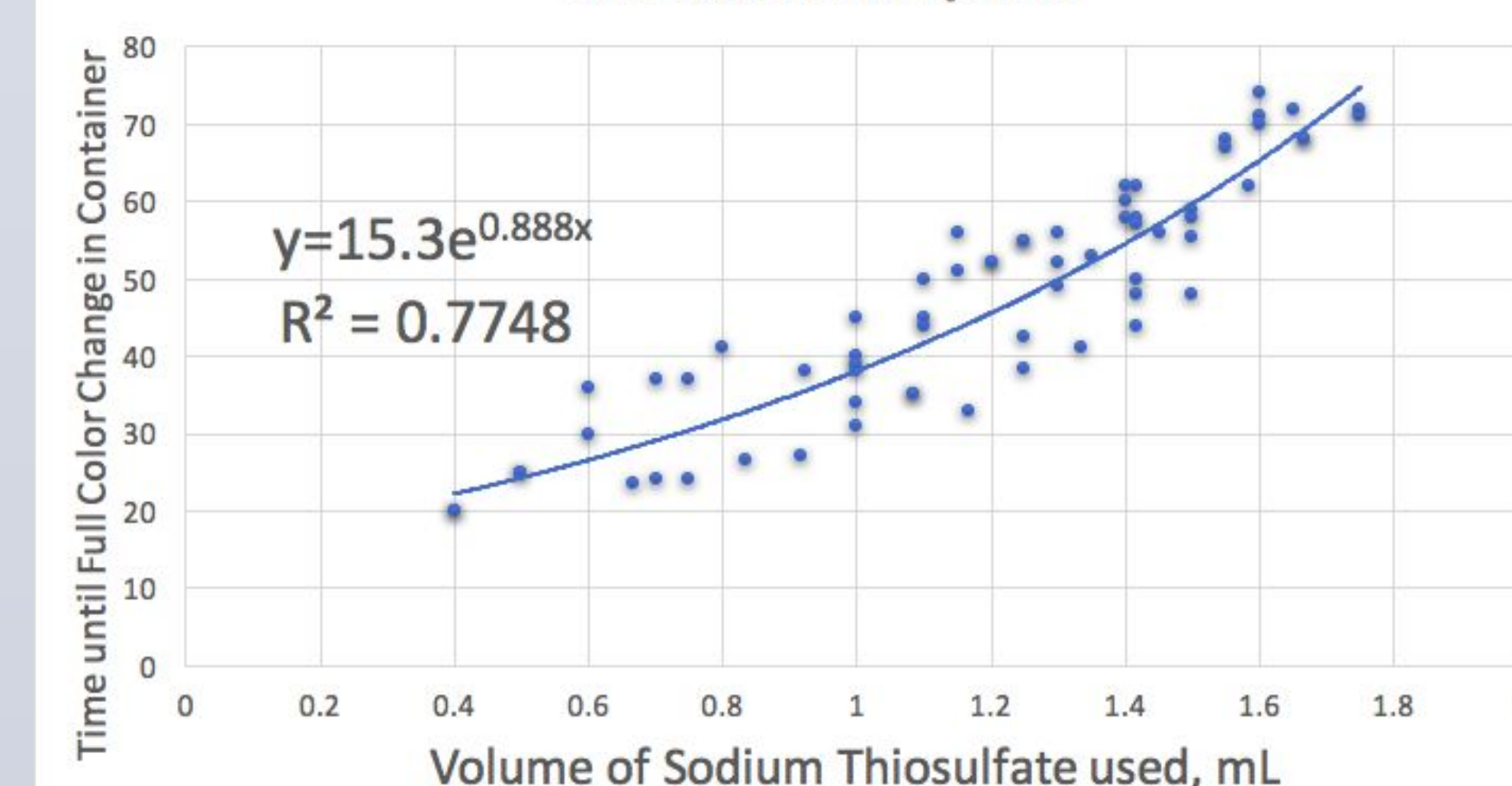
Equation I (Rate Limiting Step), II, & III



TIME CONTROL

1. Use vehicle's mean velocity to calculate time
2. Measure the Sodium Thiosulfate volume necessary, based on model below

Figure 1: Model of Contrasting Na₂SO₃ volumes against time in IC Stopping Reaction, Isothermal For 63.5 oC, constant starch/H₂SO₄/KI/H₂O concentration and volumes in system



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