



# UBC Chem-E-Car: Regionals 2017

The University of British Columbia | Chem-E-Car Engineering Design Team

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Interactive Poster  
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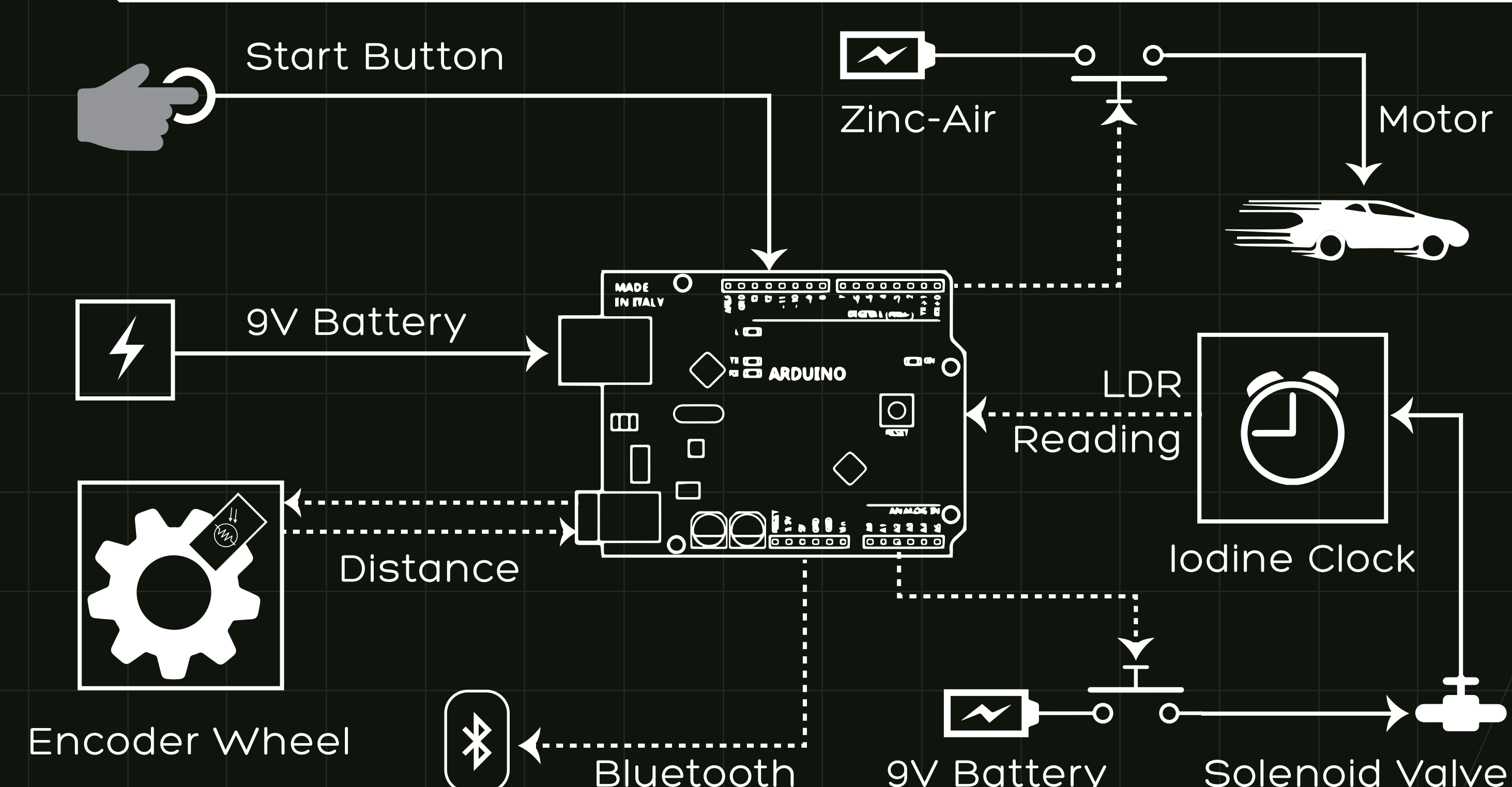
## Introduction

- > Our zinc-air powered vehicle uses an iodine clock timing reaction. Our vehicle is actuated with an Arduino controller that has custom electronics and an algorithm designed to reduce operational errors. **Safe operation** is emphasized in the design features.

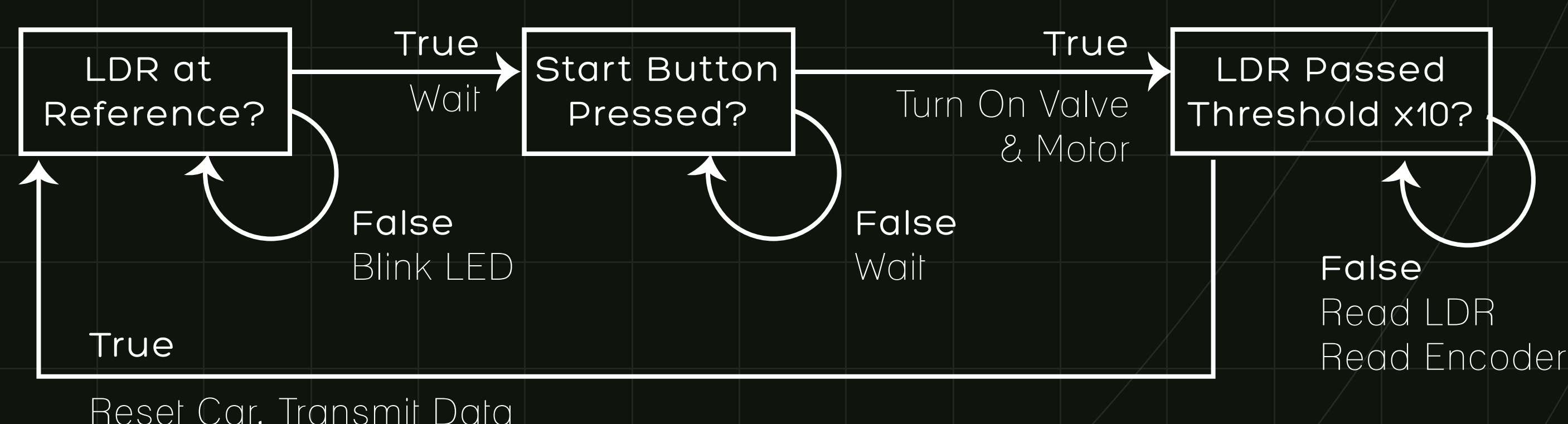
## Unique Features

- > Isolated casing for electronic components protects against **chemical spills** and **fires**.
- > Secure connectors and insulating wires **prevent fires**.
- > Secure suspension **ensure consistent steering**.
- > High-traction wheels **prevent slipping**.
- > Lockable iodine clock secured to base **contains any spills**.
- > Low centre of gravity **prevents tipping**.

## Control Mechanism



## Control Algorithm



## Stopping Mechanism & Calibration Curves

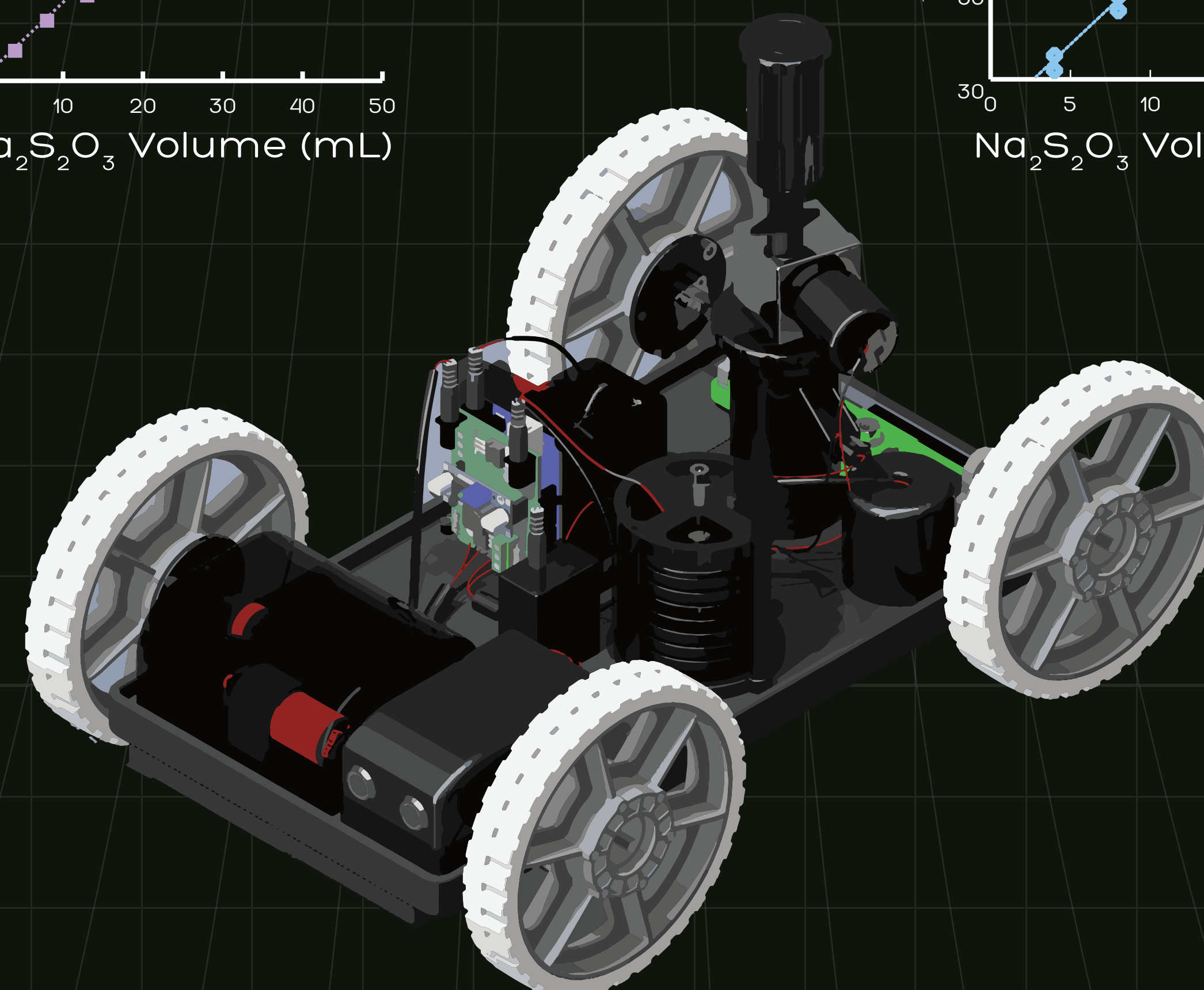
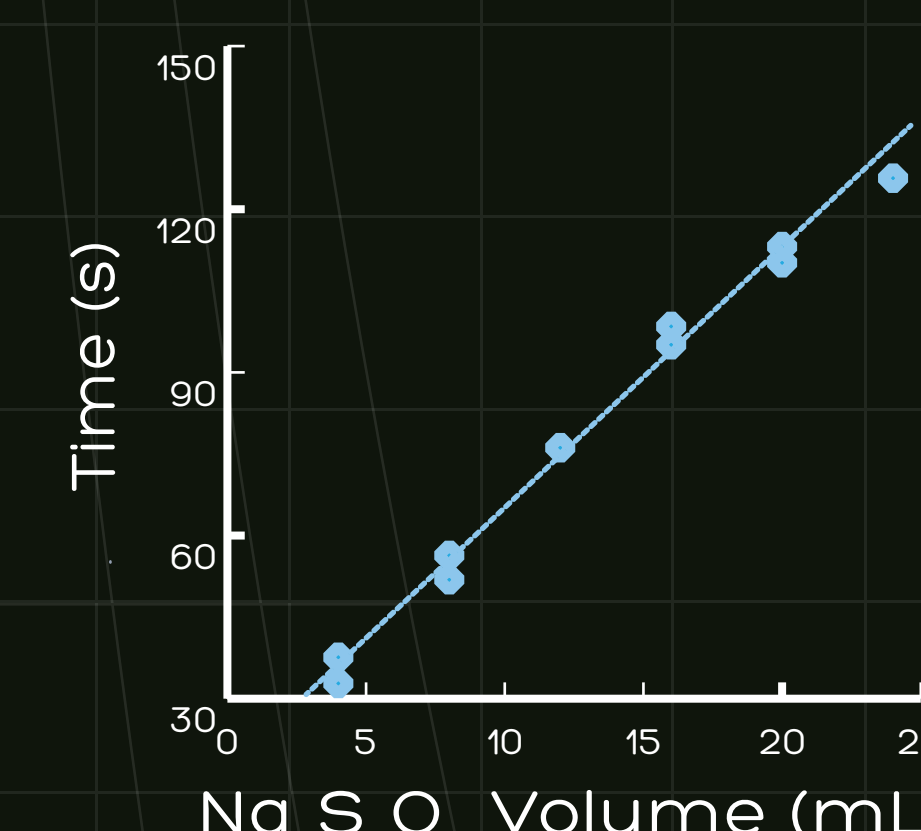
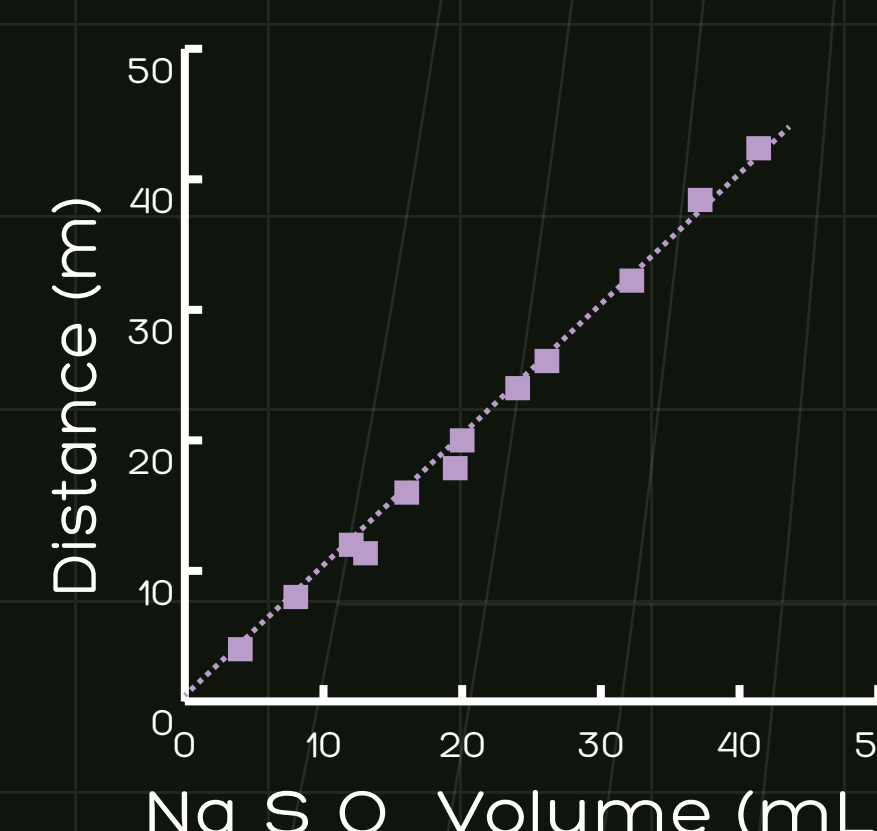
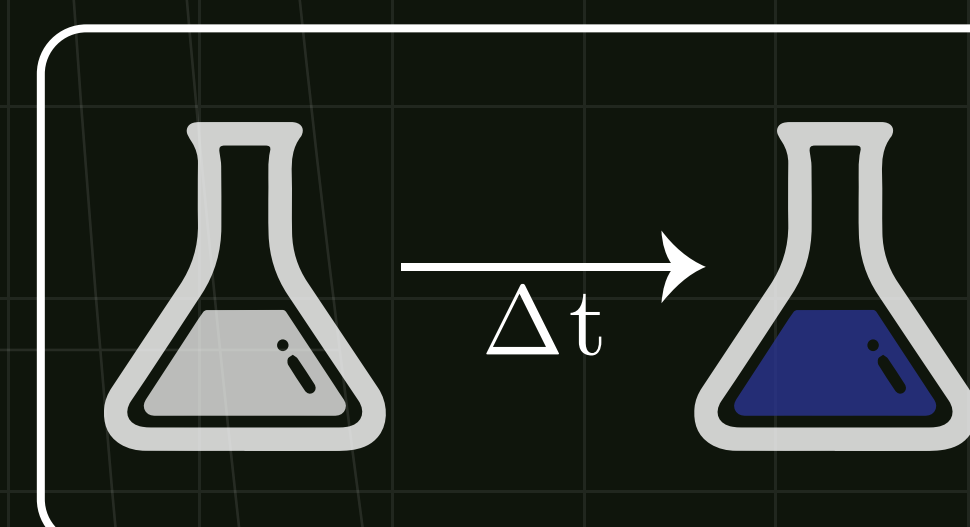
> Slow Reaction  

$$\text{H}_2\text{O}_2 + 2\text{I}^- + 2\text{H}^+ \rightarrow \text{I}_2 + 2\text{H}_2\text{O}$$

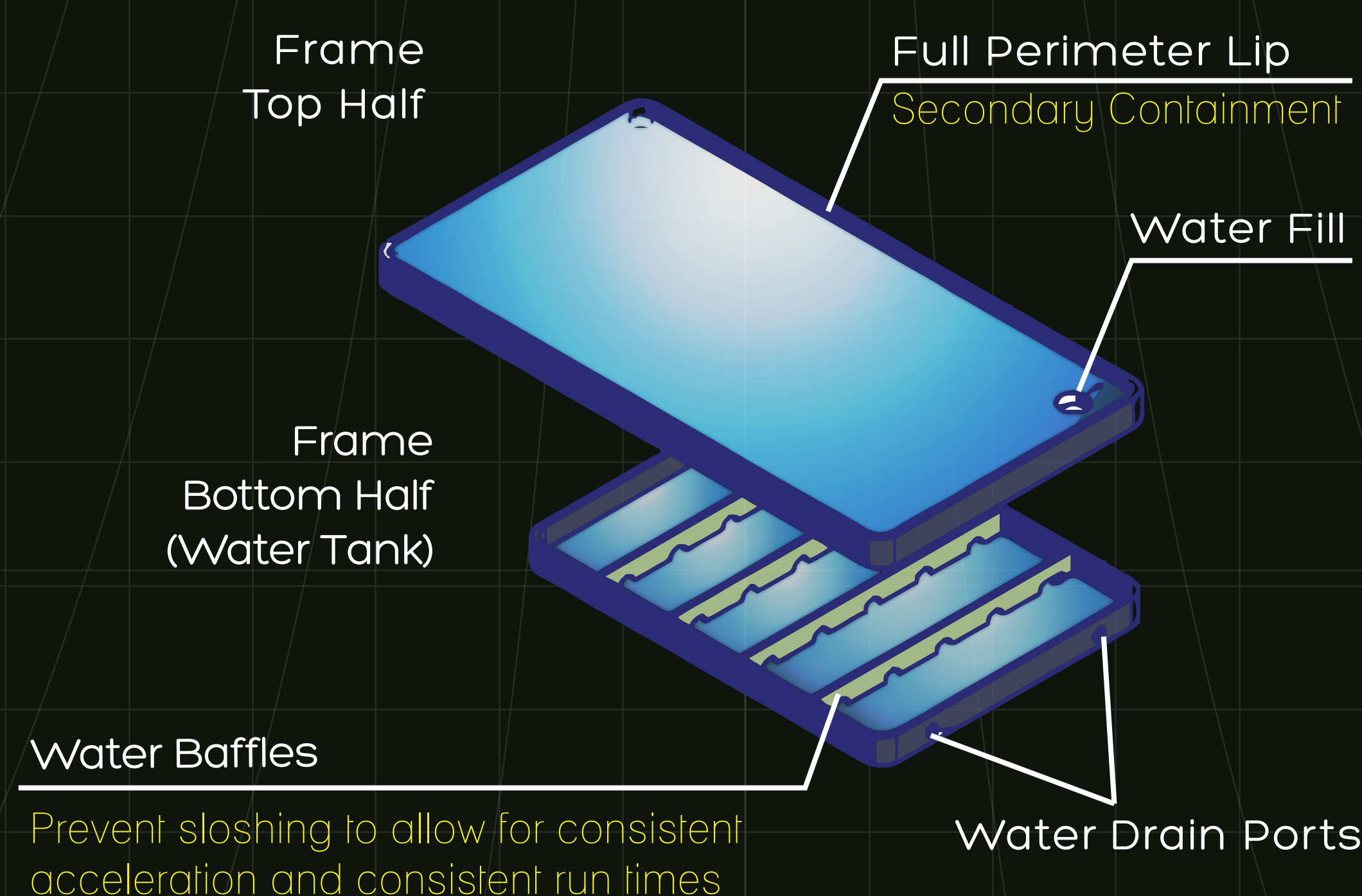
> Fast Reaction  

$$2\text{S}_2\text{O}_3^{2-} + \text{I}_2 \rightarrow \text{S}_4\text{O}_6^{2-} + 2\text{I}^-$$

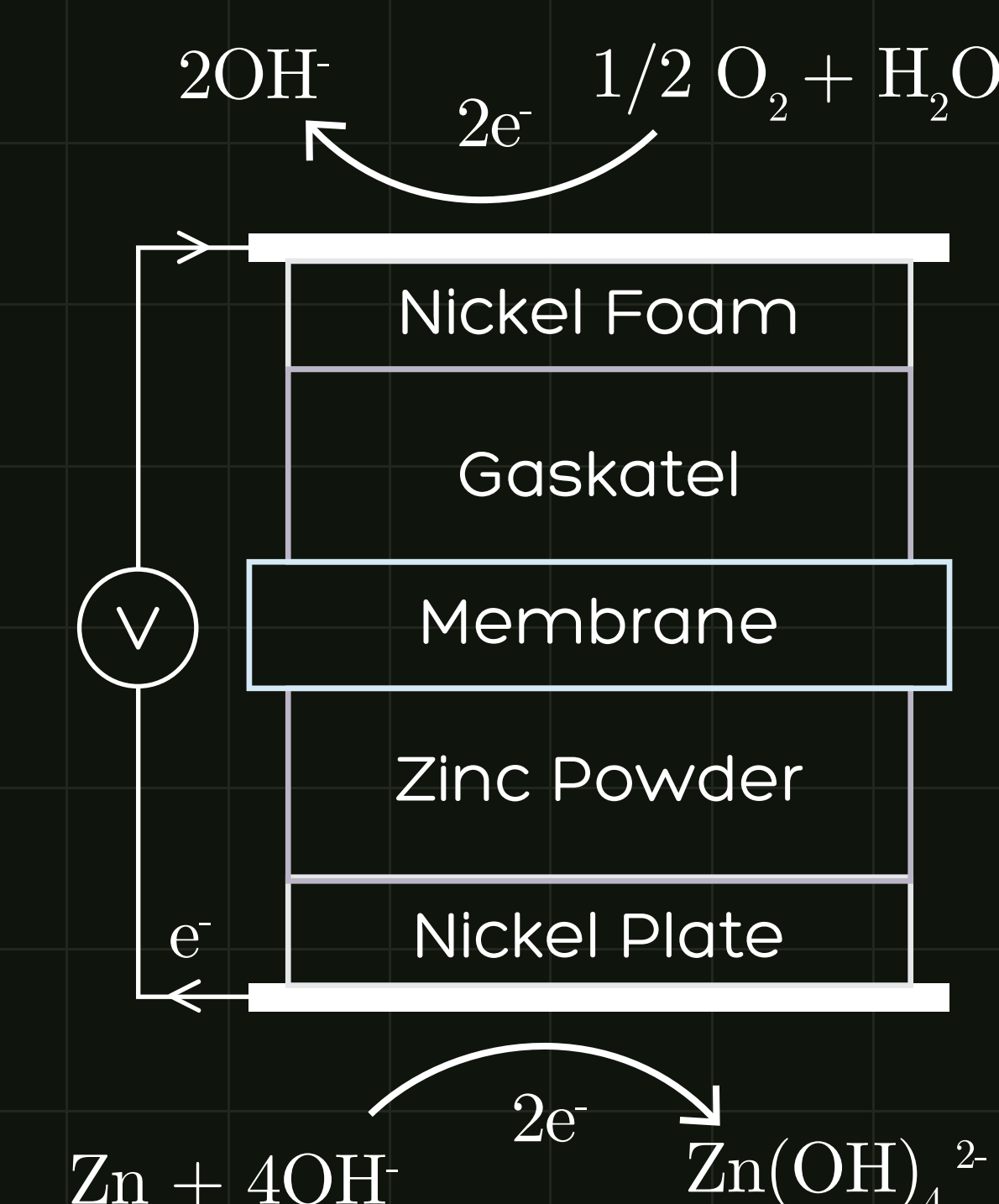
> A tri-iodide starch complex is formed and colored blue.



## Integrated Water Tank



## Power Source: Zinc-Air Batteries



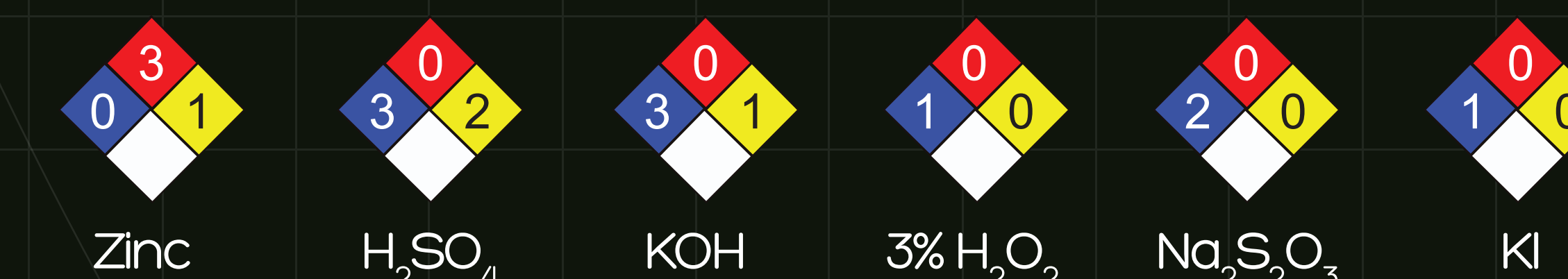
> Oxidation of zinc on the anode releases electrons which pass through an external circuit and travel to the cathode where oxygen is reduced to hydroxide ions.

> Open Circuit Potential: 1.59V

- > Each individual cell is self-contained in a primary casing to **prevent leakage** of corrosive 6M KOH. A secondary containment tower keeps the cells **sealed and secured**
- > **Corrosion-resistant** nickel electrodes increase the **lifetime of the battery**

## Safety and Environmental

- > Zinc is abundant and **easily recycled**
- > Zinc is used in small amounts in primary and secondary casing to **minimize risk of fire**
- > MnO<sub>2</sub> and ZnO are **non-toxic and inert**
- > ZnO is used as baby powder and in ceramics
- > Spent iodine clock solution is **harmless when neutralized**



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