The Iodine clock reaction is initiated when the following two solutions are mixed:

A. 3.0% Hydrogen Peroxide (H₂O₂) & 0.18 M Sulfuric Acid (H₂SO₄)
B. Potassium Iodide (KI), Sodium Thiosulfate (Na₂S₂O₃), Distilled Water, & Corn Starch

3 Reactions occur simultaneously:

<table>
<thead>
<tr>
<th>Type</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Slow/Main</td>
<td>H₂O₂ + 2I⁻ → 2H₂ + I₂</td>
</tr>
<tr>
<td>2) Fast/Monitor</td>
<td>2S₂O₃²⁻ + I₂ → 5S₂O₅²⁻ + 2I⁻</td>
</tr>
<tr>
<td>3) Color/Indicator</td>
<td>I₂ + I⁻ → I₃⁻</td>
</tr>
</tbody>
</table>

I₃⁻ is generated in Reaction 1, but is consumed at a faster rate by Reaction 2.
Na₂S₂O₃ is the limiting reactant in the system. Once all of the thiosulfate ions (S₂O₃²⁻) are completely consumed, the 2nd reaction is complete.
Upon completion of Reaction 2, generated iodine and unreacted iodide form triiodide, which complexes with starch.
The triiodide-starch complex is responsible for the color change from a clear translucent solution to an opaque purple solution.

The overall reaction is shown below:

Zn + Ag₂O → ZnO + 2Ag (E°cell = 1.6V)

In a silver oxide (I) cell, zinc forms the anode of the battery. The cathode is composed of silver (I) oxide along with an electrolyte paste of water and potassium hydroxide.

Anode: Zn + 2OH⁻ → ZnO + H₂O + 2e⁻
Cathode: Ag₂O + H₂O + 2e⁻ → 2Ag + 2OH⁻

The CORE of the battery is Ag₂O paste which is the cathode andZn is the anode. Ag₂O and Zn are pushed to the negative and positive, respectively in the battery due to the positive E°cell.

Stabilization of reaction occurs by addition of starch to form a black color complex.

1. Black box blocks ambient light
2. Reactions vessel initially containing Solution A
3. The needle of the syringe is permanently mounted on top of the black box, allowing for the syringe to be unscrewed and filled with Solution B.
5. A flashlight is the source of light for the photo-resistor.
6. The Arduino microcontroller, connected to the photo-resistor, is programmed to measure the light intensity quantitatively and is integrated into the car’s circuit.
7. Once the light intensity drops below the preset minimum, the car circuit is cut and the car stops.

The Iodine clock reaction is complete.

The Chassis
- Composes of a modified RC Car with a Plexiglass platform
- Plastic, re-sealable container houses the two battery stacks
- Dashboard platform is installed in the plastic container to stabilize and ensure batteries are level
- The water vessel is secured to the lid of the container
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- The water vessel is secured to the lid of the container
- The car runs in reverse in order to minimize lateral movement as the intended back wheels are more stable
- Connections between the battery and motor are done with spade connectors in order for batteries to be easily replaced

The Reaction Chamber

The Reaction Chamber

**Possible Causes for Deviations**
- **Electrical components**: Batteries can short out if the two metals touch.
- **Chemical components**: KOH is a strong base and sulfuric acid is a strong acid. Both must be handled carefully only with proper PPE and stored separately.

**SAFETY CONSIDERATIONS**

**RECOMMENDATIONS**

**ACKNOWLEDGEMENTS**

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