Custard Mini-Rockets

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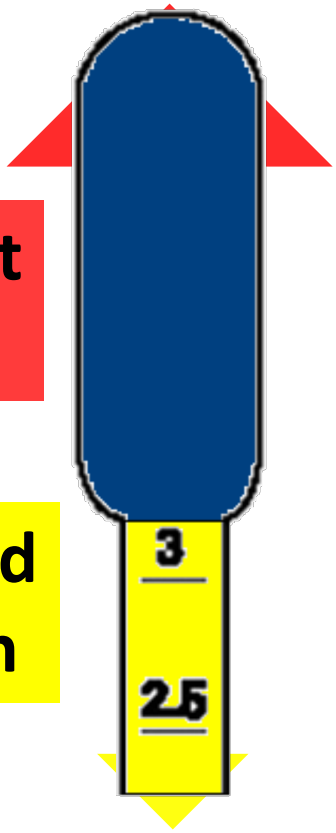
$$H_2 + {}^1/_2O_2 \longrightarrow H_2O$$

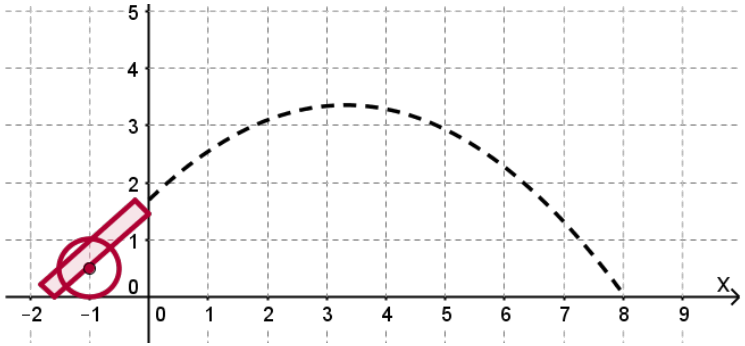
Plus lots of energy 286 kJmol^{-1}

Mini-rocket goes up

Ejector fluid goes down



Reactive mass rocket (cannon ball)



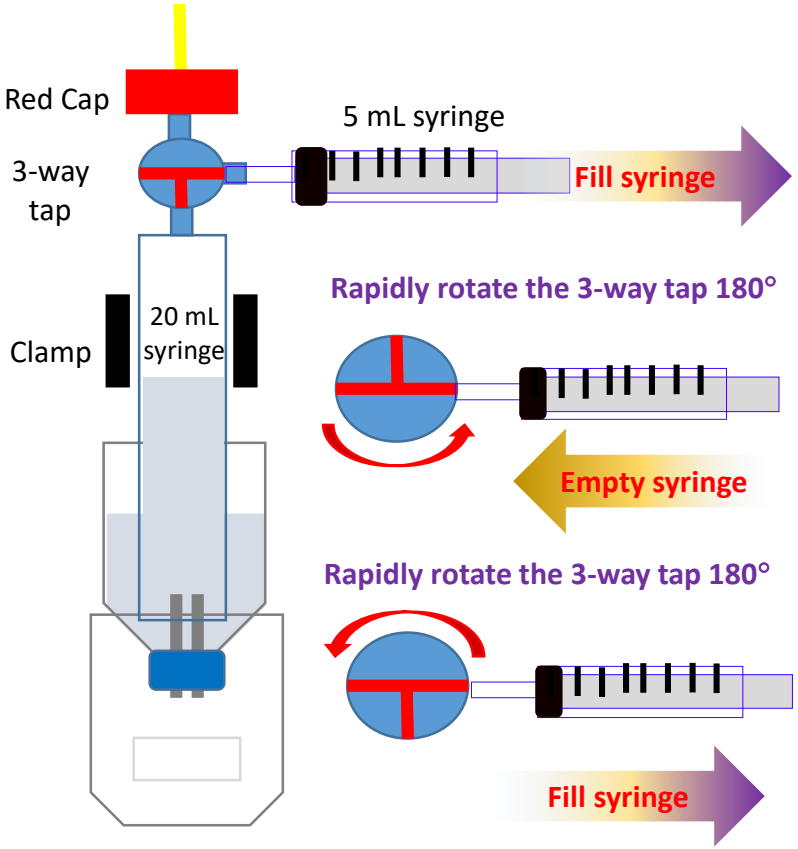
The fuel mixture ignites releasing energy.

This energy is converted into kinetic energy and shared between the rocket and ejector fluid.

$$KE = \frac{1}{2}mv^2$$

Prepare Your Electrolysis Cell

Step 1 Assemble the rest of the kit as shown below. Then completely fill the 20 mL syringe with electrolyte using the 5 mL syringe and 3-way tap. Ensure the tap is in the position shown. Withdraw the syringe barrel fully, the electrolyte should rise up the syringe as the air is removed into the syringe. Rotate the 3-way tap 180° : this will connect the syringe with the syringe needle at the top of the electrolysis cell. Push the syringe barrel in, to empty the syringe of air via the syringe needle. Repeat this process until all the air has been removed from the 20 mL syringe.



Continue this syringing process until the 20 mL syringe is completely filled

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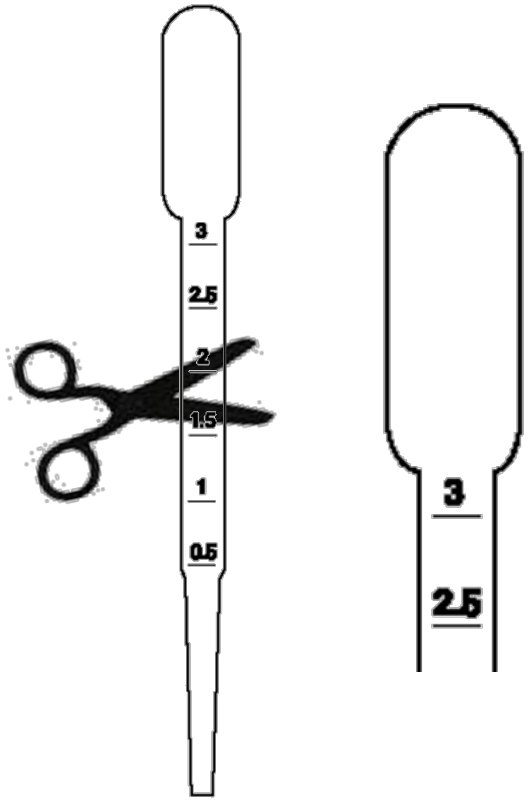
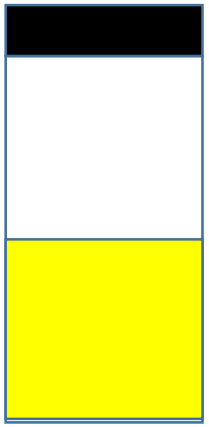
Make your pipette mini-rocket



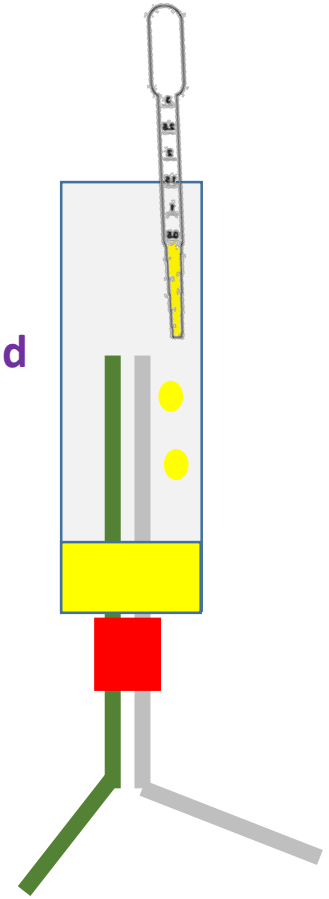
Mix ejector liquid

Custard water 50% $^{w}/_{v}$



Set up your rocket launcher

Add ~ 0.5-1mL of ejector liquid



Collecting the Rocket fuel and transferring it to your mini-rocket

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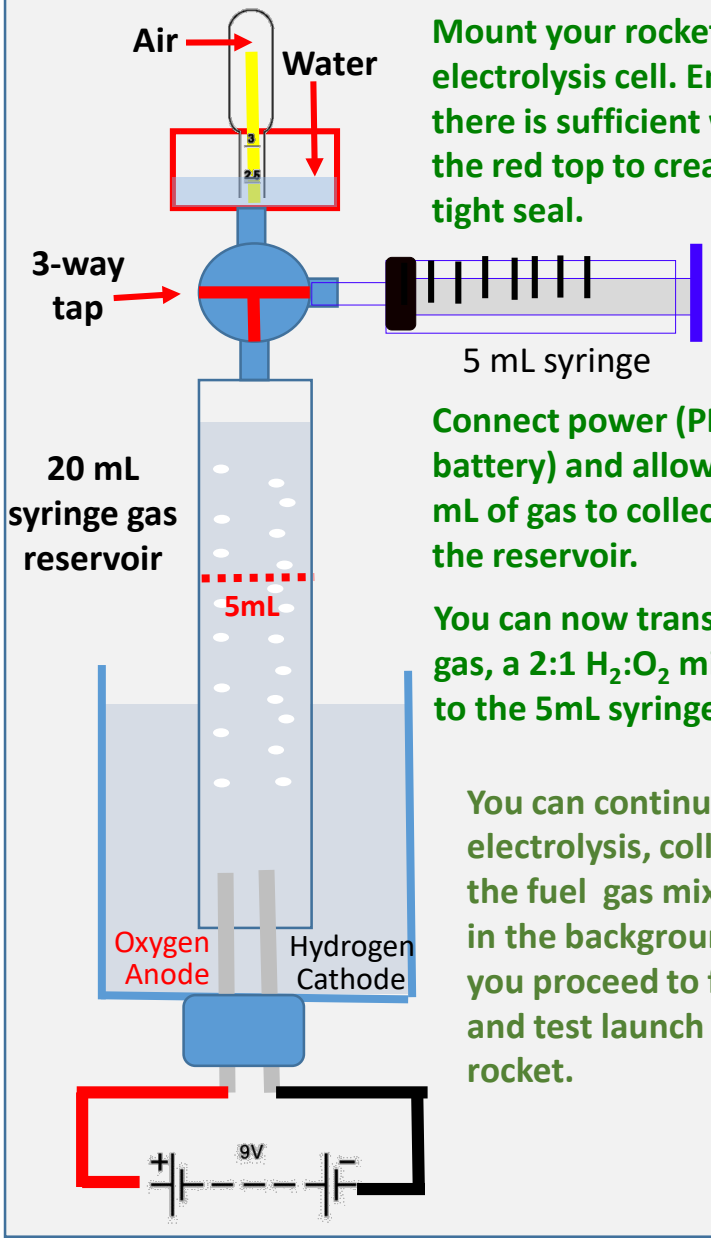


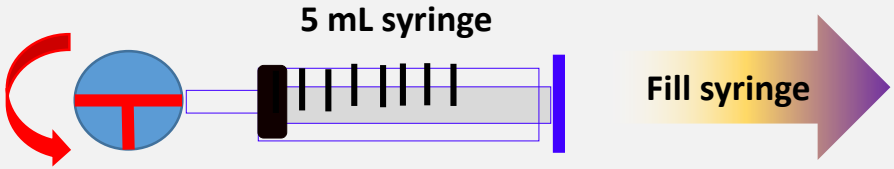
Mount your rocket on the electrolysis cell. Ensure there is sufficient water in the red top to create a gas tight seal.

Connect power (PP3 battery) and allow ≈ 5 mL of gas to collect in the reservoir.

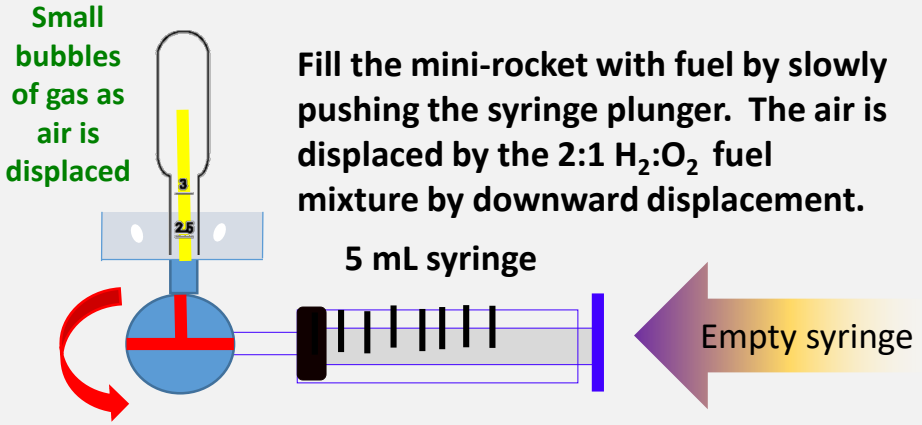
You can now transfer this gas, a 2:1 H_2:O_2 mixture, to the 5mL syringe.

You can continue the electrolysis, collecting the fuel gas mixture in the background, as you proceed to fuel and test launch your rocket.

Transferring the fuel to your mini-rocket

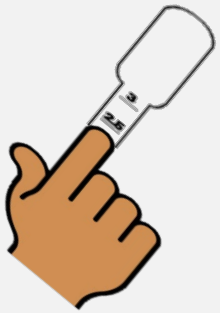


Rapidly Rotate 3 way tap 180⁰



Fill the mini-rocket with fuel by slowly pushing the syringe plunger. The air is displaced by the 2:1 H_2:O_2 fuel mixture by downward displacement.

Rapidly Rotate 3-way tap 180⁰



Carefully transfer your fuelled rocket to the launch station.

Do not allow any fuel to escape

Place rocket on pre-prepared launcher

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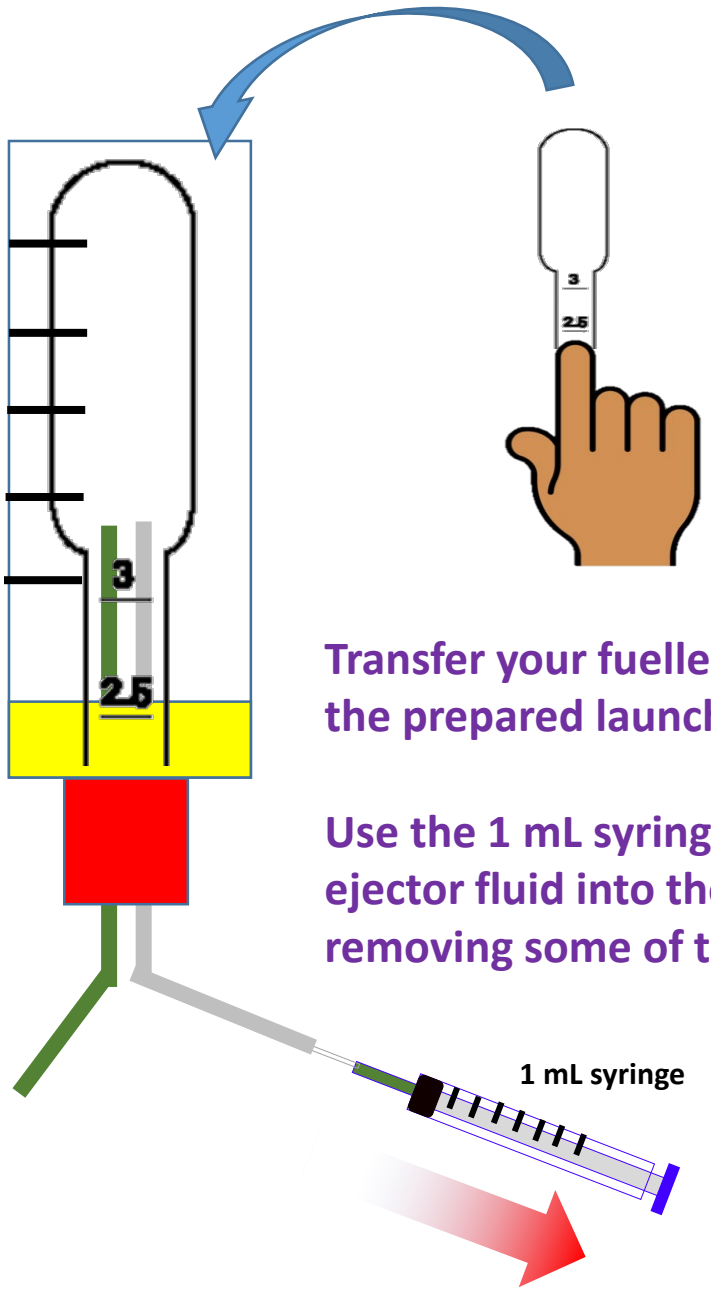
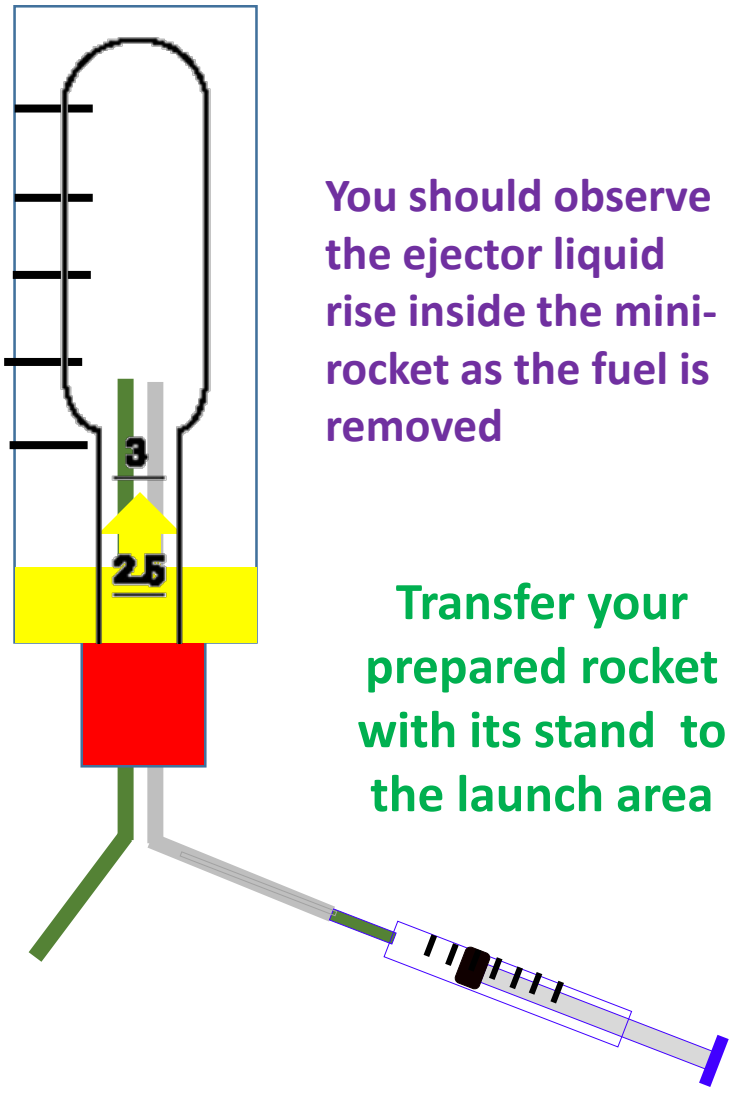


Transfer your fuelled rocket to the prepared launcher stand.

Use the 1 mL syringe to load ejector fluid into the rocket by removing some of the fuel.



You should observe the ejector liquid rise inside the mini-rocket as the fuel is removed

Transfer your prepared rocket with its stand to the launch area

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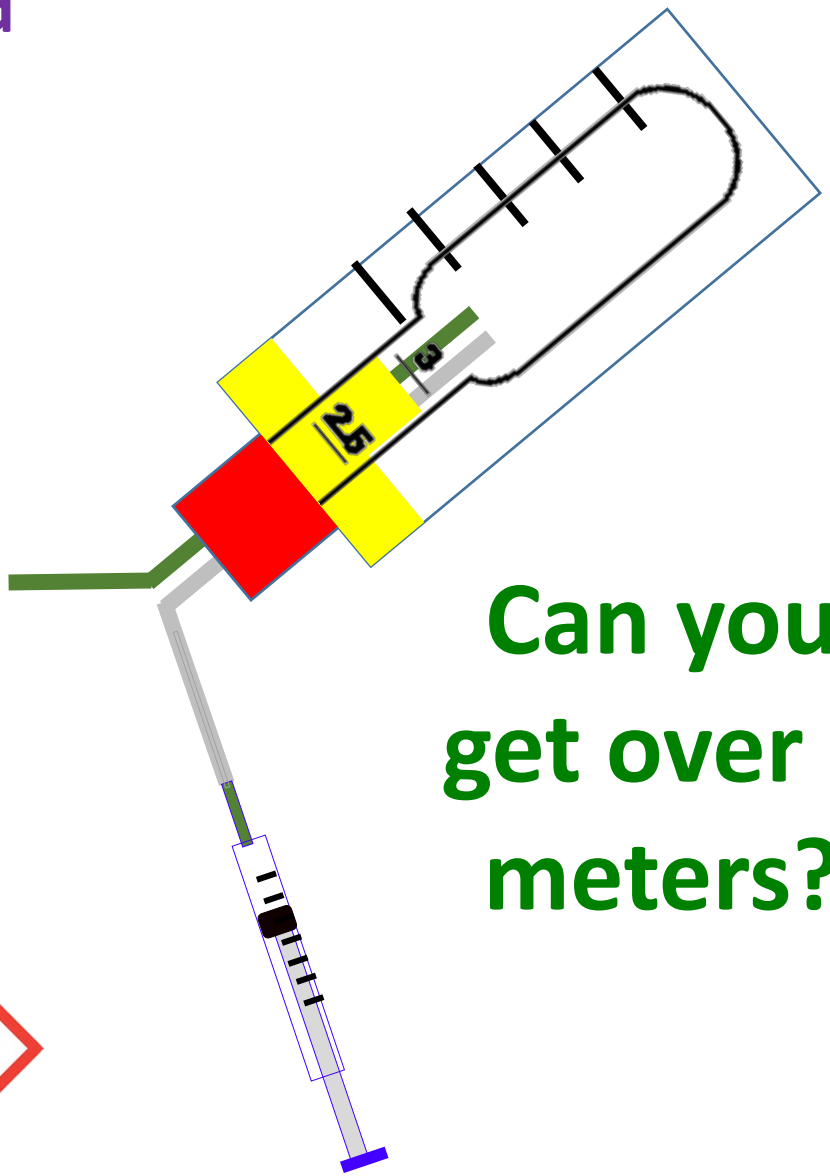
Transfer the rocket to launch area.

Adjust the launch angle and connect the ignitor wires.

Check the launch area is clear before launching.



Can you get over 8 meters?

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Potential variables to explore.

- Launch angle θ
- Length (mass) of mini rocket.
- Ratio of ejector fluid to fuel
- Composition of ejector liquid

Ratio of custard to water

are there alternative ejector liquids.