

# The “Barking Dog” Experiment

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# Materials\*

- Isopropyl alcohol
- Glass bottle
- Long handled lighter
- Borax (optional)



\*Amounts vary depending on size of container used



# Safety precautions

- Handling fire

Keep away from fuel and any flammable objects

- Fumes

Inhaling large amounts of isopropyl alcohol can cause nausea, vomiting, irritation of the nose and mucous membranes, throat irritation and difficulty breathing

- Safety goggles & gloves

Isopropyl alcohol is an eye irritant and large amounts can be absorbed through the skin and cause poisoning





# Procedure

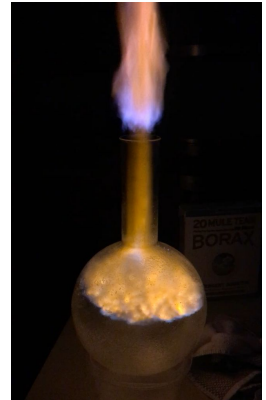
**Step 1:** Pour measured amount of isopropyl alcohol into container (30 ml)

**Step 2:** Shake to coat the sides and create vapor

**Step 3:** Place container on safe, stable surface

**Step 4:** Egnite the vapor with lighter inside the mouth of the container

**Step 5:** Listen and observe



# Trials



Trial 1



What I learned:

- Not visible in daylight but audible
- No “barking”

Trial 2



What I changed:

- Container shape
- Lower light

What I learned:

- Better sound from container shape

Trial 3



What I changed:

- Lighting
- Replenished alcohol

What I learned:

- Works best when cooled

Trial 4 with Borax (40 grams)



What I learned:

- Flame behaved generally the same
- Color changed
- Softer “bark”

# Chemical reaction



Stoichiometry:

(isopropyl alcohol) ← limited reactant

$$(\text{CH}_3)_2\text{CHOH} = 60.096$$

$$20 \text{ ml isopropyl} = 15.8 \text{ g}$$

$$\frac{\text{g}}{\text{m}} \rightarrow \frac{15.8}{60.096} = 0.25$$

$$\begin{aligned} \text{density} &= 786 \text{ kg/m}^3 \text{ or } 0.79 \text{ g/ml} \\ (\text{density} \cdot \text{mL} &= \text{g}) \downarrow \\ 0.79 \cdot 20 &= 15.8 \text{ g} \end{aligned}$$

$$31.998 \text{ g of } \text{O}_2 \longrightarrow 0.25 \div 2 \cdot 9 = 1.125 \text{ moles}$$

$$44.009 \text{ g of } \text{CO}_2 \longrightarrow 0.25 \div 2 \cdot 6 = 0.75 \text{ moles}$$

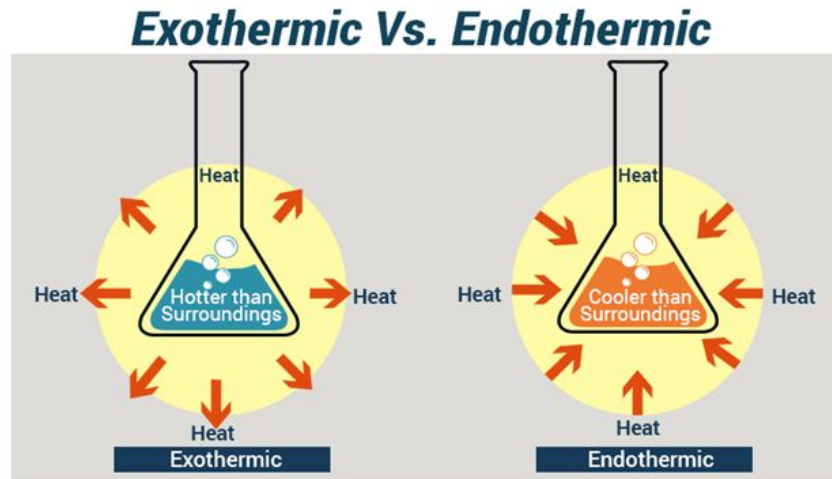
$$18.015 \text{ g of } \text{H}_2\text{O} \longrightarrow 0.25 \div 2 \cdot 8 = 0.0625 \text{ moles}$$



# Enthalpy

Exothermic reaction

Because of the combustion, the container is left feeling warm



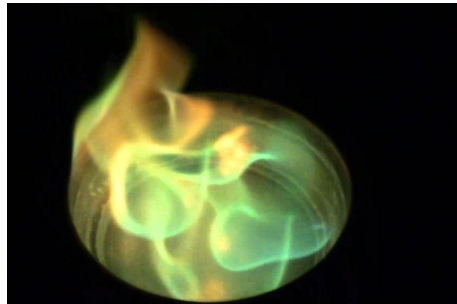


# Colored flame

- Isopropyl alcohol burns blue



- A green(ish) flame can be achieved by using borax





**Thank you!**

