

# RESEARCH AND DEVELOPMENT

## I. DISCOVERY: keep a journal



- **What is hydrogen?**
- What are the **physical and chemical properties** of hydrogen?
- Where does hydrogen **come from**?
- How do we **safely store it** before we use it?
- **Map out** the locations of United States **Hydrogen Manufactures**?
- Where can you locally **fill up** a hydrogen storage canister in your state?
- How available is hydrogen to **buy**?
- What are the **different sources of hydrogen** on earth? How is it **extracted**?
- Hydrogen gas is lighter (less dense) than air and is combustible-it burns quickly when a flame is introduced. **How much lighter than air** is hydrogen?
- Oxygen gas is about the same density as air and **facilitates combustion**. What does this mean?
- What is **electrolysis**?
- How do we **safely work** with hydrogen?
- Where can you find the best **information on hydrogen safety**?
- How can you **set up your lab** to work safely with hydrogen fuel cells?
- **Compare hydrogen** to other fuels?
- What **current technologies and inventions** use hydrogen as a fuel?
- **What is a FUEL CELL?**
- What **materials make up the FUEL CELL** we shipped you?
- Describe **how the FUEL CELL works**? How do we get **energy** from it? Explain its **electrochemistry**?
- There are **several types of fuel cells**. What **type** of fuel cell is in your kit?  
**Types of fuel cells:** Proton-exchange fuel cell (PEM); Reversible Fuel Cell; Direct-methanol fuel cell; Direct Borohydride Fuel Cells; Solid-oxide fuel cells; Molten-carbonate fuel cells; Phosphoric-acid fuel cells; Alkaline fuel cells; Ammonia fuel cells
- **Map out** the fuel cell companies listed in the **USFCC** web sight (**usfcc.com**), the Fuel Cell Europe - **World Fuel Cell Council** web sight (**fuelcellmarket.com**), and the **OFCC** (**fuelcellsohio.org**)
- **Why do we need coalitions?** Does your state have a (FCC) fuel cell coalition?
- What **fuel cell business resources** are in your state?
- Map out **your state's** fuel cell resources?
- If your team were **employees** in the fuel cell industry where do you think they would **like to work and why**?
- Do you think fuel cells are **expensive**?
- What are **your thoughts** on how costs can be brought down?
- What **benefits do you see** using fuel cells in our everyday lives?
- What **type of business would you put into your neighborhood** to help its citizens adapt to hydrogen fuel cells?
- What does **renewable energy** mean compared to **nonrenewable energy**?
- What are the **environmental advantages** of using hydrogen fuel cells? (Water, Air, Land)
- What is **your opinion**, how can using fuel cell technology help **America**?
- What does the **Wright Fuel Cell Group** do? (**wrightfuelcellgroup.org**)
- Is there a **group** like this in your state?
- What **schools in the USA** teach fuel cell technologies?