HackAP Hackathon - Life Sciences
Problem Statements

Problem 1: Natural Remedies for Stomach Ulcers

What's the Problem?

- **H. pylori** is a harmful bacterium that lives in the stomach and causes painful ulcers (sores in the stomach lining)
- Many people have H. pylori infections that don't respond to regular antibiotics anymore (antibiotic-resistant)
- Current treatments are expensive and sometimes don't work

What You Need to Design:

- **Natural remedies** using plants, herbs, or other natural ingredients
- Solutions that can kill H. pylori bacteria without harsh chemicals
- Products that people can buy without a doctor's prescription
- Remedies that stay good at room temperature (no refrigeration needed)
- Low-cost options that regular people can afford

Real-World Impact:

This could help millions of people worldwide who suffer from stomach ulcers, especially in areas where medical care is expensive or hard to access.

Problem 2: Natural Solutions for PCOS

What's the Problem?

- **PCOS (Polycystic Ovarian Syndrome)** affects many women and causes:
- Irregular periods
- Weight gain
- Insulin resistance
- Fertility problems
- Unwanted hair growth
- Current treatments often have significant side effects
- Many women can't afford ongoing medical treatment

What You Need to Design:

- **Nutraceutical remedies** (food-based medicines) using natural ingredients
- Solutions with little to no side effects
- Products made from easily available, cheap, or free natural materials
- Treatments that don't require a doctor's prescription
- Ingredients that are available year-round without special storage

Real-World Impact:

This could provide affordable, safe alternatives for women managing PCOS, especially in communities with limited healthcare access.

Problem 3: Early Heart Disease Detection Kit

What's the Problem?

- **Atherosclerosis** is when arteries get clogged with fatty deposits
- It leads to heart attacks and requires expensive procedures like:
- Bypass surgery (rerouting blood around blocked arteries)
- Stents (tiny tubes to keep arteries open)
- By the time symptoms appear, the disease is often advanced
- Current detection methods are expensive and require hospitals

What You Need to Design:

- **Early detection kit** that can catch the disease before it becomes serious
- **Minimally invasive** (maybe just a finger prick) or completely non-invasive
- **Home-use friendly** - people can test themselves without medical training
- **Affordable** for average families
- **Easy to interpret** results

Real-World Impact:

This could prevent heart attacks and save lives by catching heart disease early, while reducing healthcare costs for families and healthcare systems.

Problem 4: Edible HIV/AIDS Vaccine

What's the Problem?

- **HIV/AIDS** is a global health crisis that attacks the immune system
- HIV specifically targets and destroys the body's defense cells (immune cells)
- There are currently **no vaccines** to prevent HIV infection
- Existing treatments are expensive drugs that manage the disease but don't cure it
- Prevention methods require consistent behavior changes that are hard to maintain

What You Need to Design:

- **Edible vaccine** that can be eaten like food
- Safe for people of all ages to consume
- Available in **farmers markets and grocery stores** (not just hospitals)
- No doctor's prescription required
- **Zero side effects**
- Easy to distribute and consume

Real-World Impact:

This could revolutionize HIV prevention globally, making protection accessible to everyone regardless of economic status or healthcare access. It could dramatically increase life expectancy in regions heavily affected by HIV/AIDS.

Problem 5: Affordable Stem Cell Collection and Storage

What's the Problem?

- **Stem cells** are "master cells" that can become any type of cell in the body
- They're crucial for treating cancer, severe burns, spinal injuries, and other serious conditions
- Current methods to obtain stem cells are:
  - **Extremely expensive** (tens of thousands of dollars)
  - **Ethically controversial** (often require embryonic tissue)
  - **Invasive and painful** (bone marrow extraction, etc.)
  - **Hard to preserve** (require expensive equipment and facilities)

What You Need to Design:

- **Economical process** for obtaining human stem cells that regular families can afford
- **Ethically acceptable** method that doesn't cause social controversy
- **Non-invasive** procedure (no surgery or painful extractions)
- **Simple preparation** process that doesn't require advanced lab equipment
- **Efficient preservation** method to store stem cells long-term
- **Complete solution** from collection to storage

Real-World Impact:

This could make life-saving stem cell therapies available to millions of patients who currently can't afford them. It could transform treatment for cancer patients, burn victims, and people with degenerative diseases.

Problem 6: Natural CFC Alternatives for Cooling

What's the Problem?

- **CFCs (Chlorofluorocarbons)** are chemicals used in air conditioners, refrigerators, and cooling systems
- CFCs are destroying the **ozone layer**, which protects Earth from harmful UV radiation
- When the ozone layer is damaged, more dangerous UV rays reach Earth, causing:
  - Skin cancer
  - Eye damage
  - Weakened immune systems
  - Crop damage
- Current CFC alternatives still have environmental and health risks

What You Need to Design:

- **Natural cooling process** that completely avoids CFCs and harmful alternatives
- **Reliable system** that works as well as current air conditioning/refrigeration
- **Economical solution** that reduces manufacturing costs
- **Environmentally safe** process that protects the ozone layer
- **Scalable** for mass production and widespread use

Real-World Impact:

This could help heal the ozone layer globally, protecting billions of people from harmful UV radiation while making cooling systems more affordable and environmentally friendly.

Key Requirements for All Solutions

Design Requirements:

- **Complete solution** ready for prototype development
- **Detailed flowchart** showing how your solution works
- **Cost estimation** for building and testing your prototype
- **Timeline** for development and testing
- **Lab requirements** needed for testing

Success Criteria:

- **Accessible** - Available to common people
- **Affordable** - Low-cost solutions
- **Safe** - Minimal side effects
- **Practical** - Easy to use without extensive training
- **Sustainable** - Ingredients/components available long-term

Why These Problems Matter:

All six problems focus on making healthcare and environmental solutions more accessible and affordable for regular people, especially those in underserved communities. They emphasize prevention, natural solutions, and innovative approaches over expensive traditional interventions. Each solution could have global impact by addressing fundamental challenges that affect millions of people worldwide.