

MUFG Hackathon

ChemVR

Jay Gondaliya - 22070122088

Kshitij Gurbuxani - 22070122097

Rutu Bhanderi - 22070122168

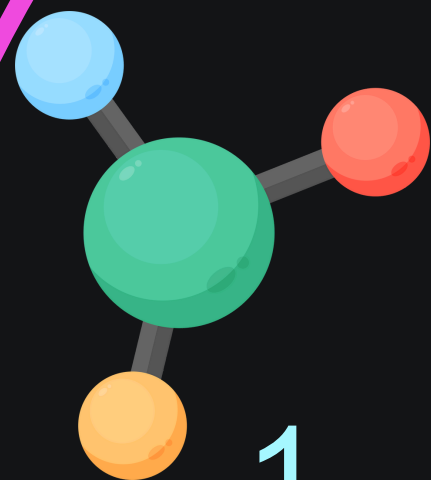
Problem Statement

**Immersive AI-Powered Learning
Experience Using VR/Metaverse**

Use case #3



Why Students Struggle with Chemistry



- 1 Textbooks present complex, 3D molecules as flat, confusing diagrams.
- 2 This forces students into “rote memorization” instead of fostering true understanding.
- 3 Invisible forces like electron repulsion and bond angles are nearly impossible to grasp from a page, leading to disengagement.



Introducing ChemVR

ChemVR is an immersive VR platform that transforms abstract chemical concepts into tangible, interactive experiences.

Students don't just see molecules; they build them, manipulate them, and watch them react in a hands-on virtual laboratory.

It makes the invisible visible.



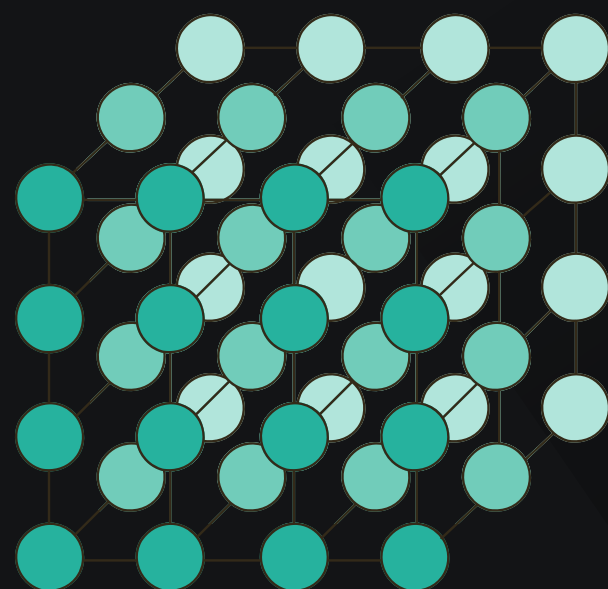


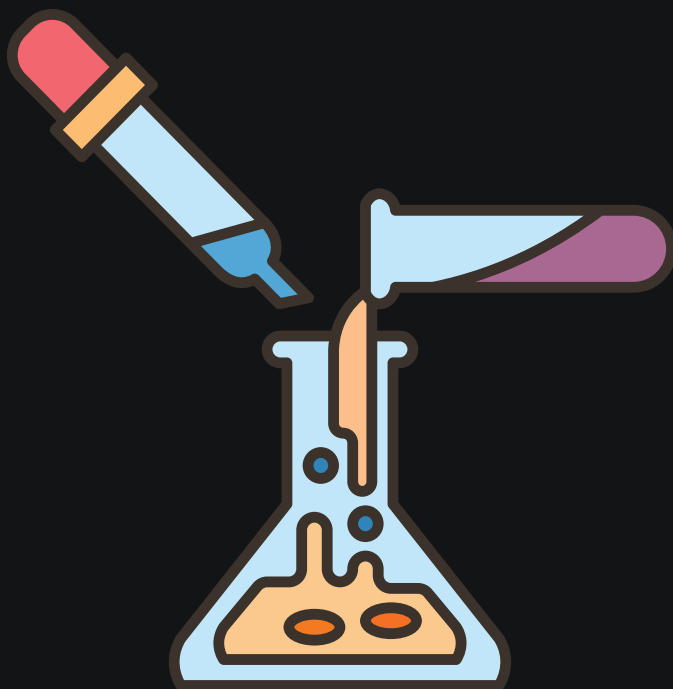
The Core Experience: Learn by Building

From Passive Viewing to Active Creation

A simple 3-step process that defines the user experience:

1. **Grab:** Select atoms from an intuitive, interactive periodic table.
2. **Build:** Snap atoms together to form molecules. Feel haptic feedback as bonds form correctly or repel from incorrect angles.
3. **Explore:** Manipulate your creation in 3D space, visualize electron clouds, and trigger reactions to see principles in action.





The AI Lab Assistant: Your Personal Tutor

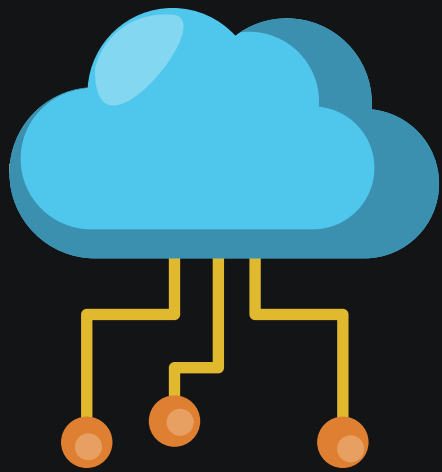
A Guide for Every Student

- **Guided Discovery:** The AI provides real-time hints and explanations. For example: "I see you've created ammonia. Notice its trigonal pyramidal shape due to the lone electron pair."
- **Adaptive Challenges:** The AI generates gamified tasks that adapt to the user's skill level, ensuring they are always challenged but never overwhelmed.
- **Reaction Predictor:** The AI analyzes molecules the user combines, predicts the outcome, and explains the fundamental principles behind the reaction.

Impact: Fostering a Deeper Understanding

From Rote Memorization to Intuitive Mastery

- Gamified, hands-on learning makes a difficult subject fun and engaging.
- Fosters a true, intuitive feel for chemical principles that textbooks cannot provide.
- Kinesthetic learning (learning by doing) is proven to dramatically improve long-term knowledge retention.



Tech That Makes It Possible

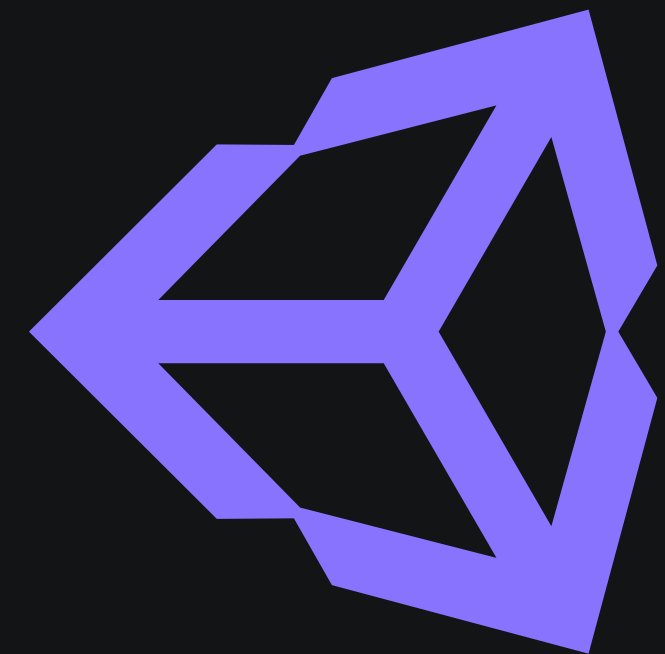
Built for the Future of Education

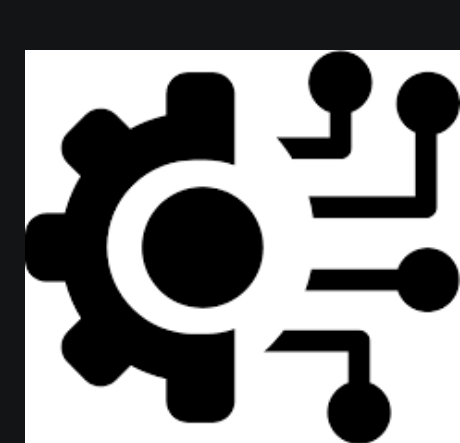
1. Unity Engine (Frontend):

- Bringing science to life through a hyper-realistic, fully interactive 3D lab.
- VR-ready and physics-accurate — every reaction looks and feels real.
- Cross-platform magic so it works anywhere, from VR headsets to laptops.
- Creates an immersive experience firsthand.

2. Google Cloud (Backend)

- Zero downtime, global reach : your virtual lab is always open.
- Enterprise-grade security to keep data safe.
- Scales effortlessly





Tech That Makes It Possible

Built for the Future of Education

3. Gemini API (AI Brain)

- Your personal AI lab assistant , answers questions in real time.
- Dynamic, unscripted conversations keep learning engaging.
- Understands context for personalized guidance.

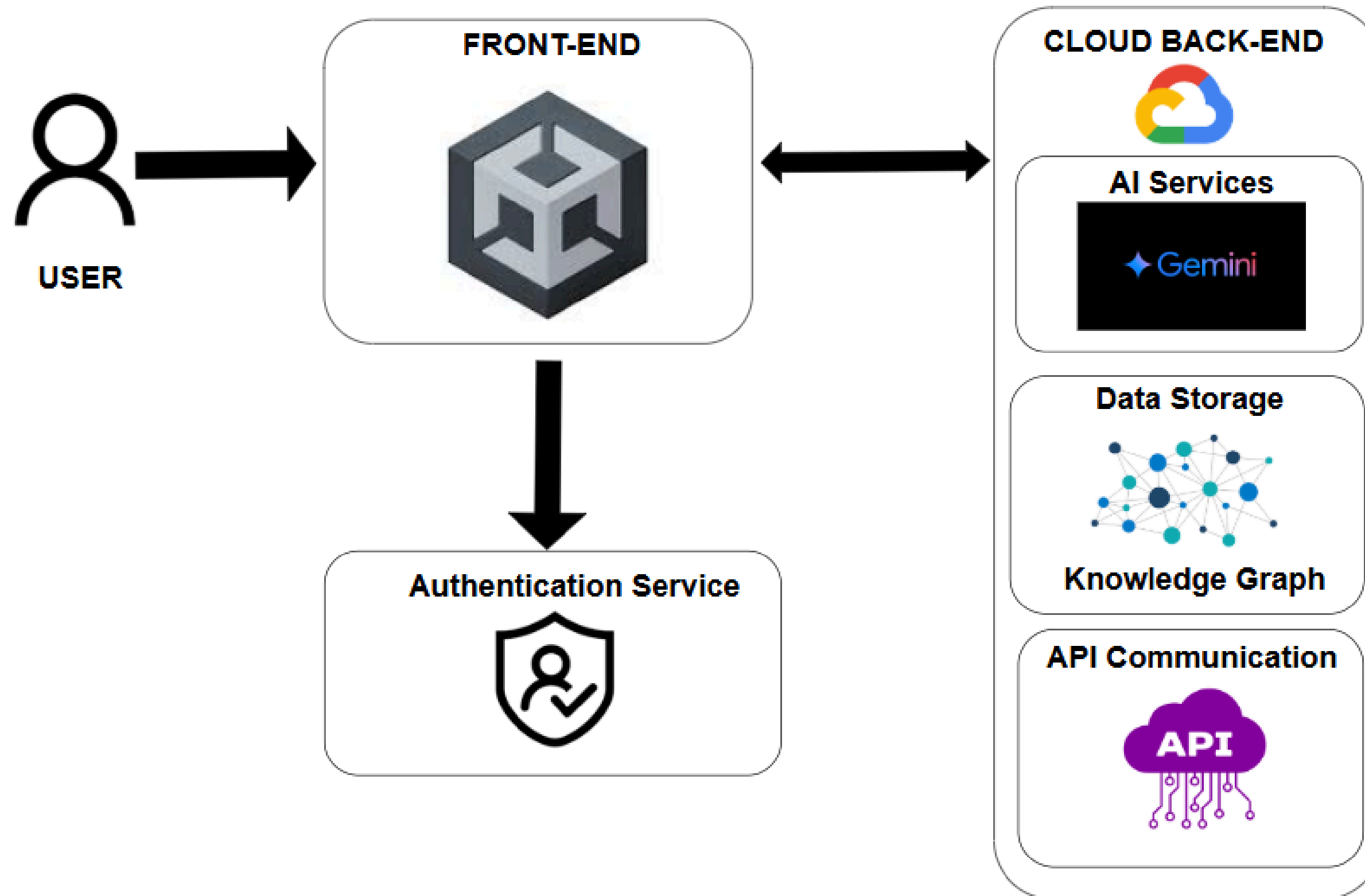


4. Knowledge Graph (Rules Engine)

- Science stays accurate — no unrealistic or unsafe chemical combos.
- Instant validation so experiments follow real-world chemistry rules.
- Learner-focused guidance for better understanding of reactions.
- Shows technical depth and commitment to real learning.



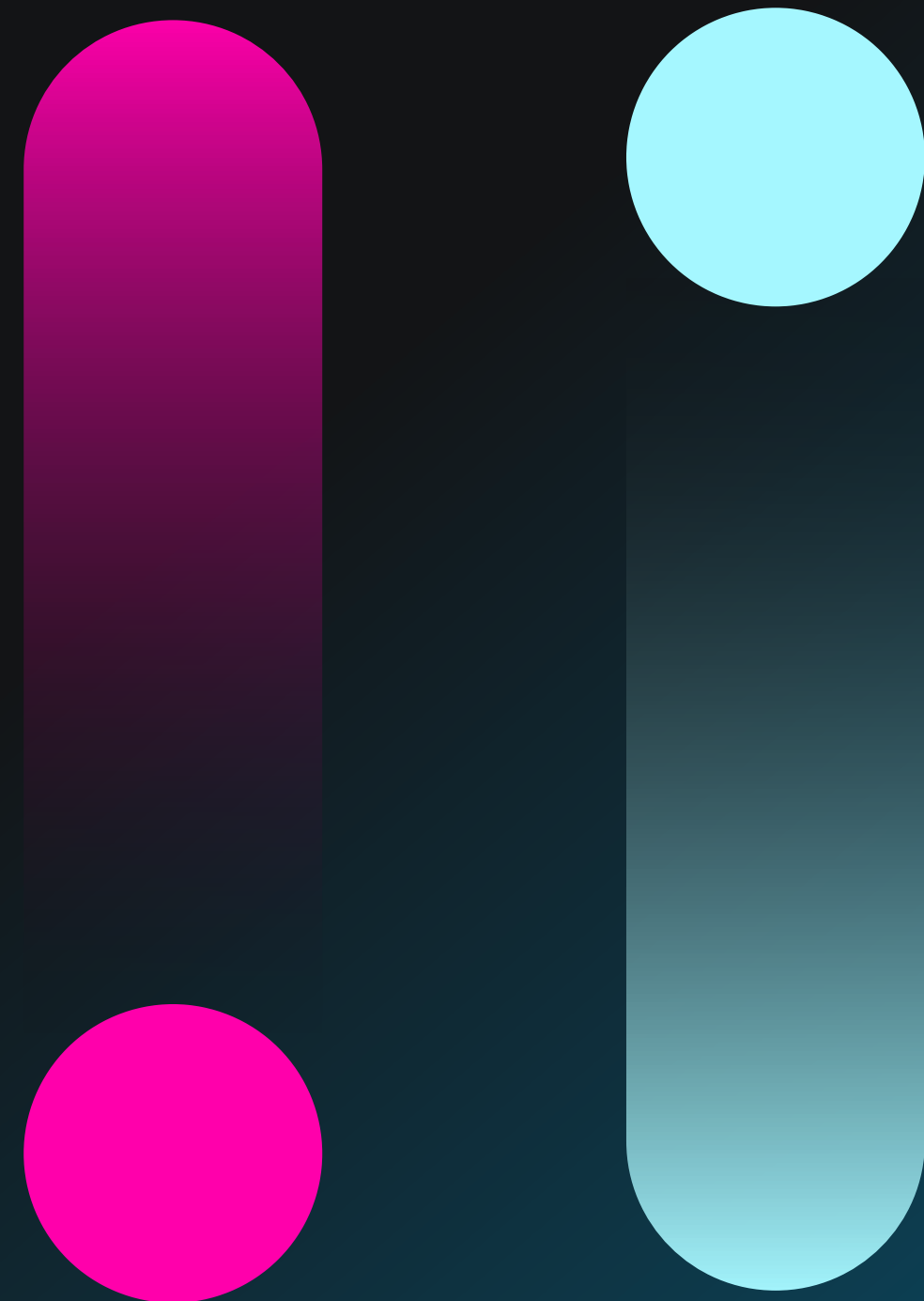
Model Diagram



Vision & Scalability: Beyond the First Molecule

The platform is a framework that can be expanded to cover all of high school and university chemistry, from basic concepts to complex organic reactions.

The core technology can be adapted for other complex subjects like biology (protein folding), physics (visualizing magnetic fields), and engineering.



Thank You

