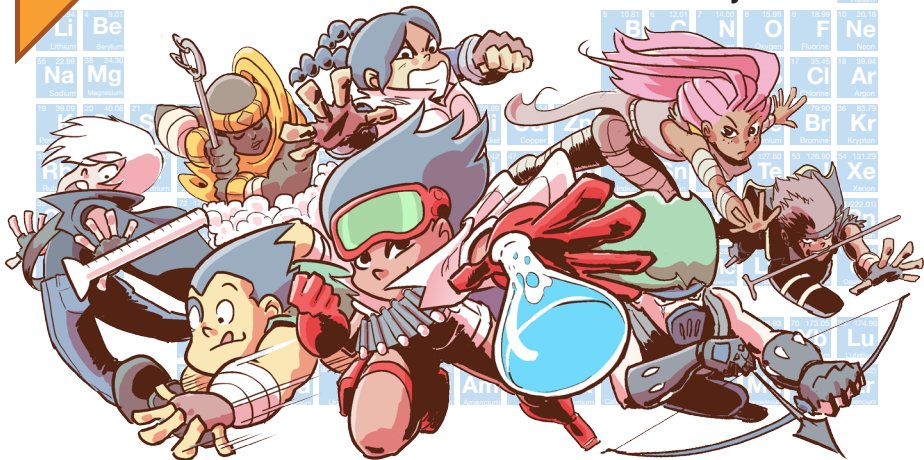
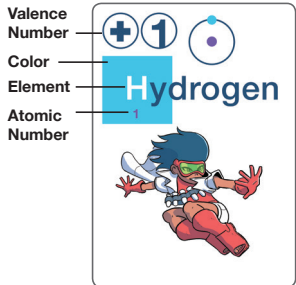


# SCIENCE NINJAS VALENCE®

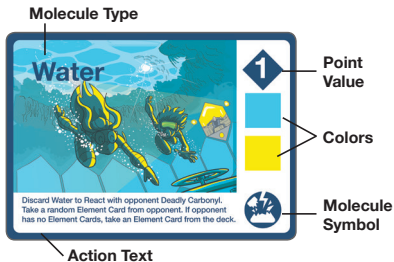
Instructions  
with  
Element and  
Ninja Guide





## 48 Element Cards

12 Oxygen	8 Chlorine
10 Hydrogen	2 Potassium
3 Carbon	2 Calcium
6 Sodium	1 Helium
4 Fluorine	



## 46 Molecule Cards

9 Salt	5 Base
9 Water	6 Carbon Dioxide
5 Metal Oxide	4 Deadly Carbonyl
5 Acid	3 Halocarbon

**Build 10 Points worth of Molecules to win the Game!**

In Valence, players use Element cards to build Molecules. Each Molecule is worth a different **point value**, noted in the diamond in the corner. The first player to **10 points wins the game!**

# Getting Started

## Initial Setup



1. Arrange the Molecule cards in the center of your playing surface to form the **Molecule Bank**.
2. Deal each player **6 Element cards**.
3. The player with the Element card with the **highest atomic number** (the purple number at the bottom of the color box) **goes first** and turns proceed clockwise. Calcium is the highest - whoever has it usually goes first! In a tie, the next highest atomic number is used to determine who goes first.

# Drawing Element Cards

Unless someone reacted with you last turn, your turn always starts with drawing Element cards. If you have two or more Element cards in hand, draw one card from the Element Deck. If you have only one Element Card in your hand, draw two. If you have none, draw three.

If only drawing one card, you may instead draw the top card from the Discard Pile.

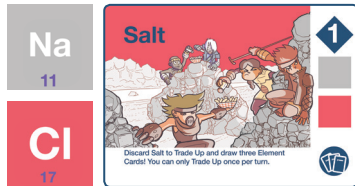
Instead of drawing, you can discard your entire hand and draw three new cards.

If the **Element Deck is empty**, reshuffle discard pile and reuse as Element Deck.

If an **opponent has reacted with one or more of your Molecules** on the previous turn, you **must skip drawing Element Cards** on your turn! You can still collect Element Cards by Trading Up with a Salt or Reacting.



Find Elements with Valence numbers that add up to zero



Take Molecule that matches colors of Elements

# Building Molecules to Earn Points and Win the Game

1. Build Molecules on your turn by finding combinations of your Element Cards whose **Valence numbers add up to zero**
2. Take the Molecule from the Molecule Bank that matches the colors of the Element Cards. Check the back of the Molecule to make sure you built it correctly.
3. Place the Molecule face up in front of you so all opponents can see - it is now in your **Molecule Stash**. If you have **ten points** worth of Molecules, you've **won the game!**
4. Place Element Cards that built the Molecule face up in the Discard Pile.

Build as many molecules as you choose on your turn. If the Molecule Bank is out of a Molecule, you cannot build it.

**Helium** is a special Element Card - add Helium to your Molecule Stash as if building a complete Molecule (worth two points) directly from your hand. All players then pass all Element cards in hand to the player to their right. If Helium is one of your first six Element cards, return to the bottom of the Element deck and replace with another card. **You cannot add Helium on your first turn!**



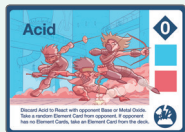
# Reacting

**Acid** and **Water** Molecules are **Reactors** and can react with certain white-bordered Molecules. You can react as many times as you choose on your turn.

Reactor

Opponent Molecule

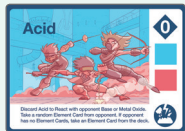
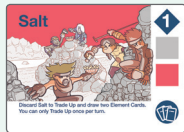
Products (collected by opponent)



→  
reacts with



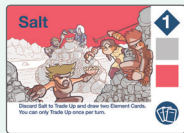
→  
makes



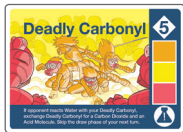
→  
reacts with



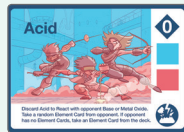
→  
makes



→  
reacts with



→  
makes



1. **Find an Opponent's Molecule and React.** The bottom of your Reactor tells you what Molecules you can react with. **Acid** reacts with **Base and Metal Oxide**; **Water** reacts with **Deadly Carbonyl**.
2. Return the Reactor to the Molecule Bank. Take a random Element Card from your opponent. If opponent has no Element Cards, take an Element card from the Element Deck.
3. **Collect Products.** Whoever owns the white-bordered Molecule replaces it with the products of the reaction. Exchange a **Base** or **Metal Oxide** for a **Salt and Water**; exchange a **Deadly Carbonyl** for a **Carbon Dioxide and Acid**. **This player skips the draw phase of their next turn!**

## Trading Up

Discard (return to the Molecule Bank) a Salt during the Build phase of your turn to draw two Element Cards from the Element Deck. **You can Trade Up once per turn.**

## Finishing your Turn

When you are done building molecules, reacting, and / or trading up, you are done with your turn. If you have 7 or more Element cards in hand, discard until you only have 6 Element cards.

# Tips and Strategies

- Try to **get rid of all of your Element cards** - then **draw 3** on your next turn! More cards = more molecules!
- You can put Element cards in the **discard pile** in **any order you choose**. If you have **Bases**, don't put anything that could make **Acids** on top!
- You don't have to build molecules every turn. Save for a **surprise Acid attack**, or a **late burst of points**. But keep an eye out for Helium...

## Alternative Rules

**Beginner Rules** - Set aside trading up and reactions and just focus on building Molecules.

**Cooperative Rules** - Work together to build every type of Molecule before reshuffling the Element deck.

**Science Ninja Rules** - Players must name the specific Molecule they're building. So if a player builds a Base from Sodium, Hydrogen, and Oxygen, they must declare they've made Sodium Hydroxide to take their Molecule! If they get it wrong, players can try again next turn.

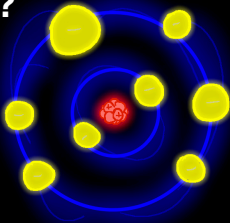




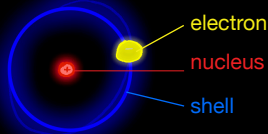
# What is Valence?

Everything in the universe is made of tiny bits called **ATOMS**. Atoms are so small you could fit a billion trillion in one drop of water!

One sextillion atoms  
(1,000,000,000,000,000,000,000)



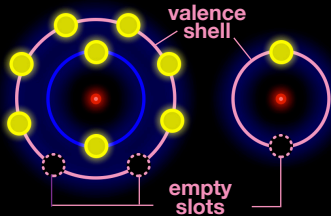
**Oxygen Atom**



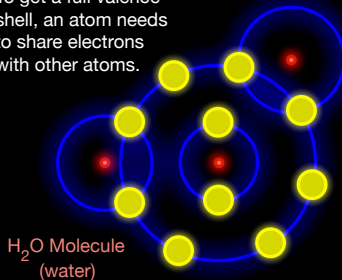
**Hydrogen Atom**

These diagrams are designed to show the atoms' structures. In real atoms, the nucleus is a lot smaller compared to the electron shell. If an atom was the size of a stadium, the nucleus would be a marble.

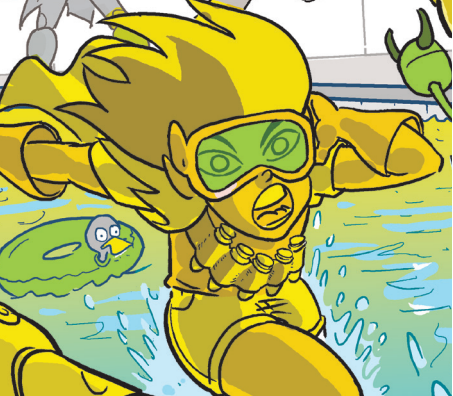
How do atoms fit together? It depends on the outermost shell - the Valence Shell. To achieve stability, an atom needs to fill any empty "slots" in its Valence Shell.



To get a full valence shell, an atom needs to share electrons with other atoms.



We call this stable group of atoms a molecule - the building block of all matter!



## Dr. Eureka Fermi

Rank: Science Ninja

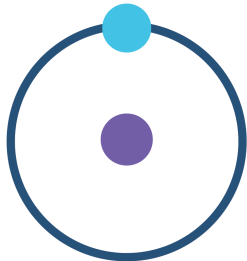
Age: 11

The youngest Science Ninja, Eureka has the brash confidence of someone whose tremendous wits and abilities have yet to fail her. Sometimes her schemes get her (and almost certainly, her peers) in hot water, but wouldn't it be boring if everything was easy all the time? Maybe Eureka feels secure because of her special relationship with Shogun - the mysterious leader of Science Ninjas.

## Hydrogen

Atomic Number: 1

It's appropriate that Science Ninjas' brightest star is represented by the first element, given that most stars are made of hydrogen. Colorless, tasteless, odorless, and flammable, a Science Ninja could use this nearly undetectable gas to cause a sneaky explosion!





## Carlos Einstein

Rank: Science Ninja Cadet

Age: 10

Genetically modified to be twelve times tougher than your typical ten year old, Carlos doesn't have a violent bone in his body. Cadets like Carlos can't go on official missions - unless a sneaky Science Ninja forges some forms to exploit Carlos' superior strength, speed, and can-do spirit. Carlos endears himself to everyone with his "aw, shucks" charm, but he can barely get through his own dumb jokes without chuckling like a knucklehead!

## Carbon

Atomic Number: 6

Carlos forms bonds with everyone he meets, and carbon forms bonds with other elements to make over ten million different compounds. Carbon can form soft, opaque graphite or hard, transparent diamonds. This capacity for diversity makes it the common element of all known life!





## Sloopeeku Okiedokie

Princess of the Mizuhan

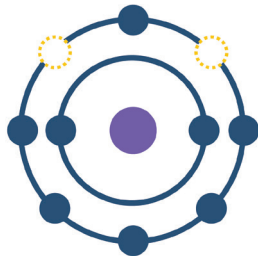
Age: 14

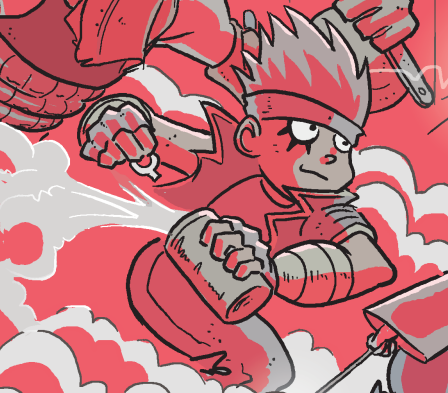
Princess Sloopeeku (Sloopy to her friends) left the waterfalls of her homeland to learn how science and technology - unseen among the technophobic folk of the Mizuhan - could improve the lives of her people. Defined by her bravery, compassion, and (all too often) striking looks, some of her colleagues (well, really just Mei) think she's just a self-righteous goody-two-shoes!

## Oxygen

Atomic Number: 8

As a vegetarian, Sloopy may not consume animals, but all animals consume oxygen for cellular respiration! We think of oxygen as something in the air, since that's how we engage with it moment to moment, but it makes up half the earth's crust as oxides, and most of the ocean ( $H_2O$ )!





## Rascal

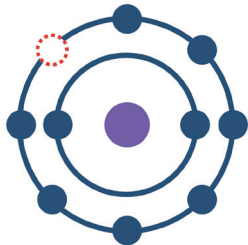
Age: ?

Much remains unknown of the shadowy agent called Rascal, including age, gender, and motivation. What is known should give even the most seasoned Science Ninja pause: Rascal is a master of martial arts, disguise, and improvised ninja tools who may assist or oppose you depending on the situation.

## Fluorine

Atomic Number: 9

Dangerous like Rascal, fluorine is a highly toxic yellow gas at room temperature. Fluorine is the most electronegative (hungry for electrons) element - it even pulls electrons from stubborn Noble gases! Despite the danger, trace amounts of fluorine added to dental products prevent cavities!





## Mei Wu

Rank: Science Ninja Cadet

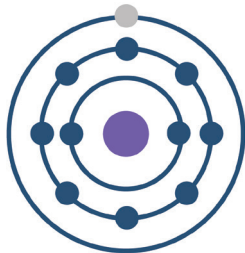
Age: 13

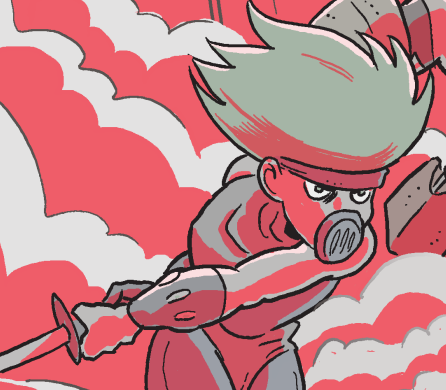
Genetically modified to be twelve times stronger than your typical teen, her peers might say she's also twelve times grumpier - just, probably not to her face. Mei is fiercely loyal to her few friends like Carlos, who know under that stony scowl lives a sensitive soul. Mei is not so sure of her smarts - she prefers problems she can fix with her fists!

## Sodium

Atomic Number: 11

Mei gets pretty salty, which is how we think about sodium when we consume it as table salt. Pure sodium is a soft metal but could burn your skin if it comes in contact with your sweat. Raw sodium, like Mei, doesn't occur in nature - it's isolated in a lab from other compounds.





## Dr. Tox

Rank: Science Ninjas Security Forces

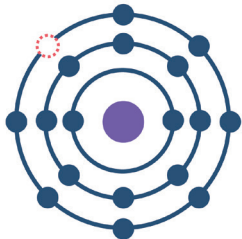
Age: ?

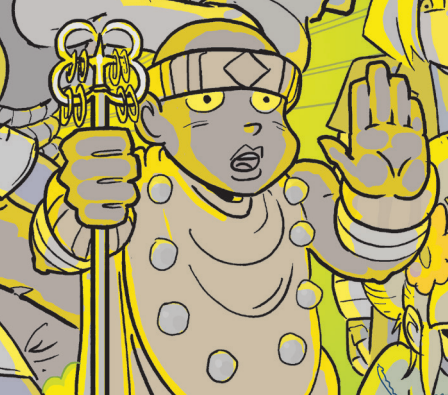
Even though most information on Dr. Tox remains classified, it's safe to assume she does Shogun's dirty work. She's sustained crippling injuries fighting Science Ninjas' deadliest foes, but cutting-edge prosthetics and implants make sure she stays on her feet. While her peers would be too terrified to ask, they may wonder how much of her is still human.

## Chlorine

Atomic Number: 17

Like Dr. Tox, chlorine is thoroughly dangerous - as a yellow-green gas it attacks the lungs, skin, and eyes. But if you harness it's destructive power, it can be helpful to humans. If you've been in a public pool, chlorine has protected you by killing harmful bacteria!





## Lo'Jian the Ascetic

Iwahan Leader

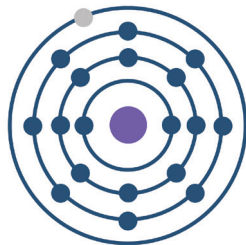
Age: ?

Forever seeking knowledge, Lo'Jian is a brilliant mathematician in a land where anything beyond the most rudimentary science is forbidden. Despite advanced training from martial arts masters, Lo'Jian abstains from violence. In tense situations Lo'Jian uses his Monk's training to lower his heart rate and limit his movements to the point of being undetectable to robotic sensors. It's rumored that Lo'Jian is much older than his youthful appearance!

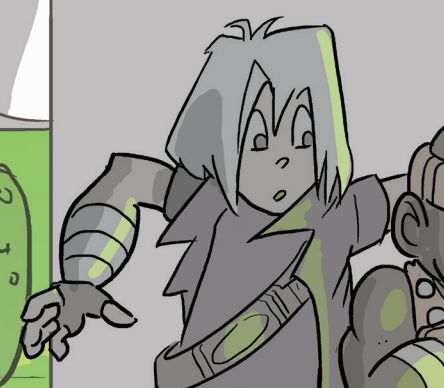
## Potassium

Atomic Number: 19

A deep thinker, the complex network of nerves firing in Lo'Jian's brain depends on the movement of potassium through nerve cell membranes. Just as vital to plants, adding potassium to soil as fertilizer is necessary for growing large quantities of crops.







## Dr. Calvin Davy

Rank: Science Ninja

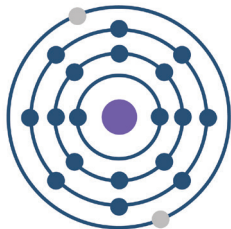
Age: 16

This wizard of electrochemistry joined Science Ninjas to access the world's best labs, with state-of-the-art hardware and brilliant colleagues. But missions? Fighting? Forget it! Wouldn't it be much nicer to analyze some data over a hot beverage with some cute lab partner? Unfortunately for Calvin, someone (usually Eureka) needs his expertise at the most inconvenient times.

## Calcium

Atomic Number: 20

Like Calvin, Calcium isn't a loner! Despite being an abundant element, it's nearly always found in compounds, like calcium carbonate in limestone and fossils! Calcium's best work is as part of a team, combining with other elements to build soap, cement, and strong bones!



# Learn Physics with **Big Trouble with Simple Machines!**

128-page full color graphic novel

Ambitious Science Ninja Eureka Fermi and her super-powered pals Carlos and Mei wedge, ramp, and wheel their way through Julie Joules' lost lab in search of a revolutionary technology. But a blown curfew, screwy obstacles, and an army of apologetic robots leaves the trio desperate, overleveraged and definitely in Big Trouble!

Along the way, readers 8 and up learn principles of force, work, mechanical advantage, and compound machines. There's even an illustrated appendix of experiments readers can do at home to build their own simple machines!





## Valence: the Graphic Novel

Available Late 2020

Carlos Einstein can fast-track his dream of becoming a Science Ninja by winning the legendary Valence Tournament, a test of chemistry knowledge and ninja prowess. But can he compete with brilliant rivals like Eureka and Calvin? Against his friend Mei's suspicions, Carlos enlists mysterious outsiders Lo'Jian and Sloopy to help navigate the dangerous Material Tunnels and grueling Molecule Exam.

The final eight contestants face a deadly labyrinth of fire, poison gas, and acid. Armed with a unique element from the periodic table, competitors must partner with rivals to build compounds that protect allies - or punish opponents. But all's fair in love and chemistry - can you really trust your competitors?

Going well beyond the chemistry taught in the game, readers 8 and up can learn a comprehensive chemistry education, including modeling atoms and molecules, intensive, extensive, and chemical properties of materials, conservation of matter, and much more!

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