

Chemistry in Minecraft #2

Isotopes are different versions of the same atoms in which the number of protons stays the same but the number of neutrons is different. Let's look at isotopes of Uranium and Americium.

Name of Isotope	Atomic Mass	No. of Protons	No. of Electrons	No. of Neutrons
Uranium-235	235	92	92	143
Uranium-238	238	92	92	146
Americium-241	241	95	95	146
Americium-243	243	95	95	148

To calculate the number of neutrons:

Subtract the number of protons from the atomic mass.

[Atomic Mass - No. of Protons = No. of Neutrons]

We can make molecules in Minecraft using the **Compound Creator**. Molecule making has a lot to do with electrons in an atom and **the outer electron shell**.



Atoms that have empty spaces in their valence electron shell join together and form molecules to fill those spaces. Noble Gases have outer valence electron shells that are completely filled, so they do not form molecules with any other atoms.

To make molecules using the Minecraft **Compound Creator**, we have to add atoms in the right amounts.

1. Salt

Salt is a molecule of Sodium and Chlorine atoms coming together to fill up empty spaces in their valence electron shell. To make the molecule of salt, let's examine the atom cards of Sodium and Chlorine. Fill in the info below.

Sodium:

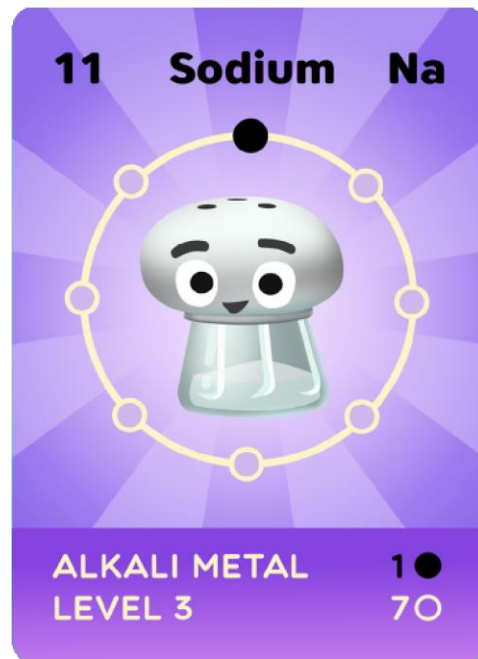
Atomic number: _____

Number of protons: _____

Total number of electrons: _____

Number of electrons in outer valence electron shell: _____

Number of empty electron slots in outer valence electron shell: _____



Chlorine

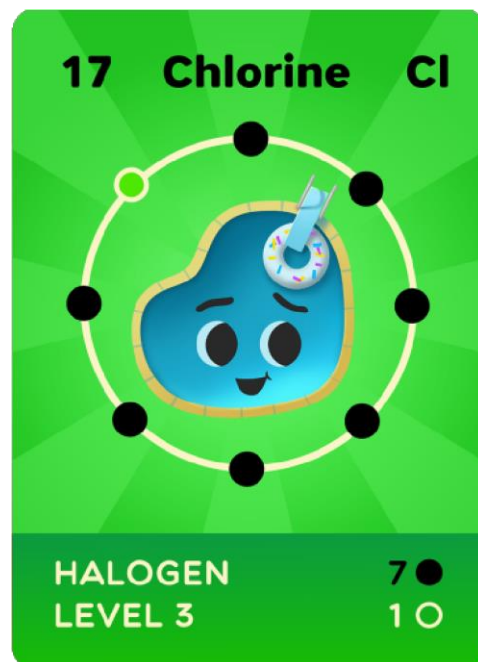
Atomic number: _____

Number of protons: _____

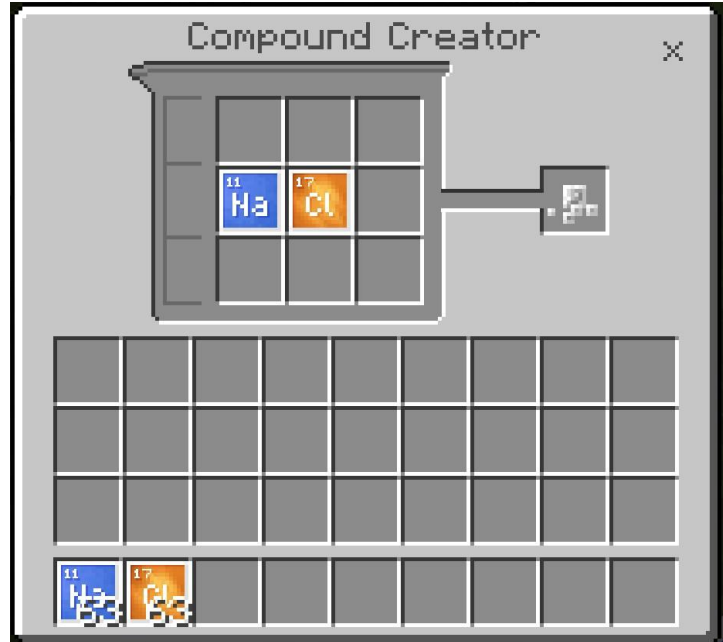
Total number of electrons: _____

Number of electrons in outer valence electron shell: _____

Number of empty electron slots in outer valence electron shell: _____ When Sodium gives away its electron to chlorine it becomes positively charged. When Chlorine accepts the electron, it becomes negatively charged. This causes them to stick together and form the molecule of salt. This type of a connection between the atoms is called an **Ionic Bond**.



To make salt in Minecraft, we need 1 atom of Sodium and 1 atom of Chlorine. Place the atoms in your inventory and open up the Compound Creator. The compound creator has a 3 x 3 grid and a square coming out of it.



Place the atom of Sodium and Chlorine in the grid and we get salt in the square to the right.

Since each molecule of Sodium Chloride or Salt only has 1 atom of Sodium and 1 atom of Chlorine, the Compound Creator will not work with more than one of those atoms.

2. Calcium Chloride

Atomic number: _____

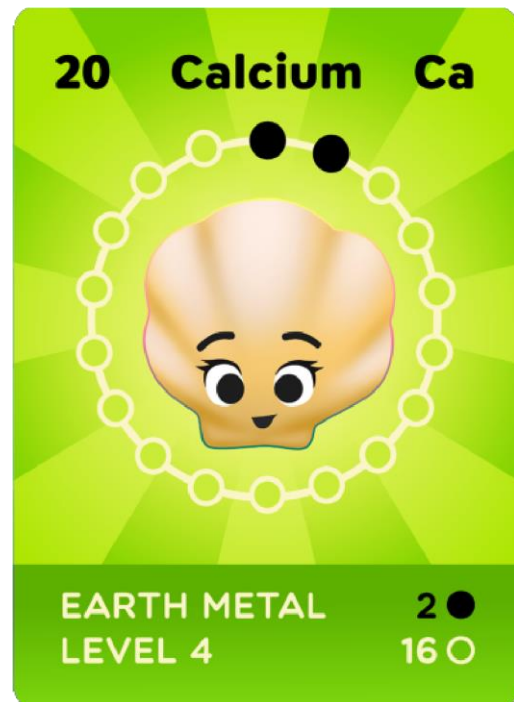
Number of protons: _____

Total number of electrons: _____

Number of electrons in outer valence electron shell: _____

Number of empty electron slots in outer valence electron shell: _____

Calcium can give away two of its electrons to an atom like Chlorine.



In the Compound Creator, if we add 1 atom of Calcium and 1 atom of Chlorine, *nothing happens*. If we increase the number of Chlorine to 2, we get a molecule of Calcium Chloride. We use Calcium Chloride to de-ice roads and make humidifiers.

Some atoms *share electrons* with each other and form molecules. These kinds of molecules are held together by what we call **Covalent Bonds**.

3. Ammonia

Nitrogen:

Atomic number: _____

Number of protons: _____

Total number of electrons: _____

Number of electrons in outer valence electron shell: _____

Number of empty electron slots in outer valence electron shell: _____

Hydrogen:

Atomic number: _____

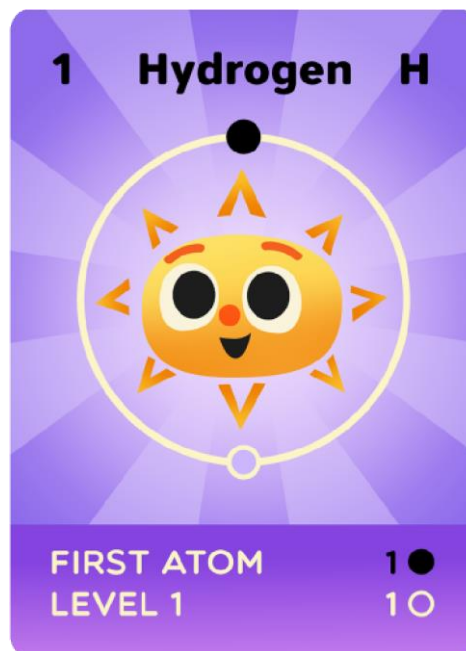
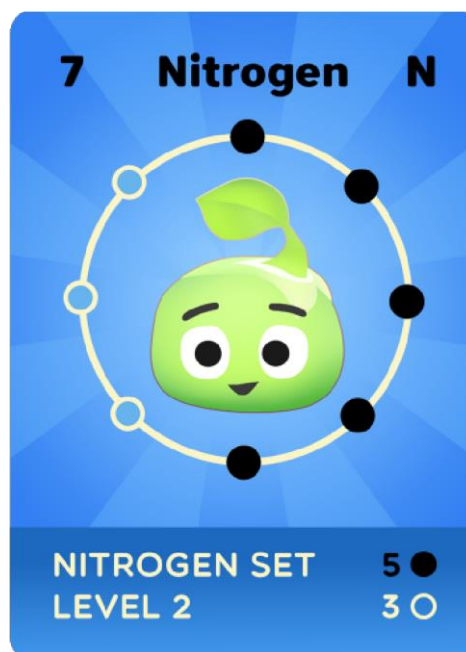
Number of protons: _____

Total number of electrons: _____

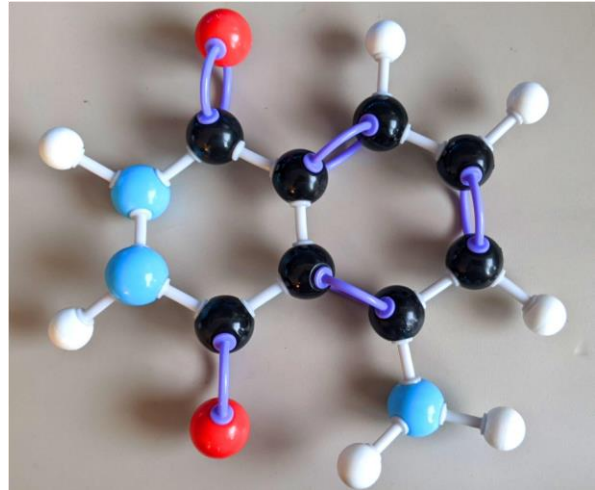
Number of electrons in outer valence electron shell: _____

Number of empty electron slots in outer valence electron shell: _____

1 atom of Nitrogen and 3 atoms of Hydrogen share electrons with each other and form a **covalent bond**. The molecule formed is called Ammonia. We use ammonia in fertilizers, cleaning supplies and smelling salts (the sharp smell of ammonia helps trigger the act of breathing).



Atoms of Carbon, Nitrogen, Hydrogen and Oxygen often share electrons with each other and form bigger molecules connected by covalent bonds. We made a molecule called Luminol in class. This is the molecule present in glow sticks.



To make Luminol we need:

- 8 atoms of Carbon (black balls)
- 7 atoms of Hydrogen (white balls)
- 3 atoms of Nitrogen (blue balls)
- 2 atoms of Oxygen (red balls)

Compound Creator + Crafting Table: Sparklers

Some metals give off colored light when they burn. The color is from the electrons jumping between electron shell levels after absorbing energy from the flame. We can use this to make sparklers in Minecraft!



To make sparklers we will need:

1. Calcium Chloride (we made this earlier)
2. Magnesium (Magnesium burns with a bright light so we use it in fireworks)
3. Stick

To put these materials together we are going to need a Crafting Table. In the 3 x 3 Crafting Table grid:

1. Place the Calcium Chloride on top 2. Place the Magnesium under the Calcium Chloride.

3. Place the stick at the bottom. This will give you an orange sparkler.



Equip the sparkler and if you shake it, it starts to give off orange sparks!

If you want a different color sparkler instead of Calcium Chloride you can use other molecules! Here are the molecules you can use to change the color of your sparkler.

Blue = Cerium Chloride (CeCl_3)

Red = Mercuric Chloride (HgCl_2)

Purple = Potassium Chloride (KCl)

Green = Tungsten Chloride (WCl_6)

Answer Key for Fill-in-the-blank:

Sodium:

Atomic number: 11

Number of protons: 11

Total number of electrons: 11

Number of electrons in outer valence electron shell: 1

Number of empty electron slots

in outer valence electron shell: 7

Chlorine:

Atomic number: 17

Number of protons: 17

Total number of electrons: 17

Number of electrons in outer valence electron shell: 7

Number of empty electron slots

in outer valence electron shell: 1

Calcium:

Atomic number: 20

Number of protons: 20

Total number of electrons: 20

Number of electrons in outer valence electron shell: 2

Number of empty electron slots

in outer valence electron shell: 6

Nitrogen:

Hydrogen

Atomic number: 7

Number of protons: 7

Total number of electrons: 7

Number of electrons

valence electron shell: 5

Number of empty electron slots

in outer valence electron shell: 3

Atomic number: 1

Number of protons: 1

Total number of electrons: 1

Number of electrons in outer

in outer valence electron shell: 1

Number of empty electron slots

in outer valence electron shell: 1