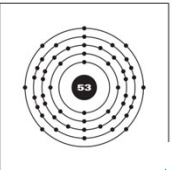
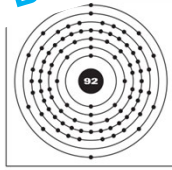


53
I
 Iodine
 126.904



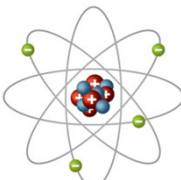
Can I Bond With U?





92
U
 Uranium
 238.028


Reviewing Matter

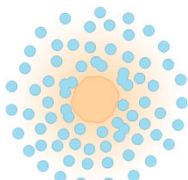
- **Atoms** have a **nucleus** consisting of **protons** and **neutrons**.
- The **nucleus** is surrounded by a cloud of **electrons** in different **energy levels**.



Electron e^- 

Proton p^+ 

Neutron n 



- The number of **protons** is the **atomic number**.
- The number of **neutrons** is the **mass number** subtract the **atomic number**.
- The number of **electrons** is the **atomic number**.

Atomic number

11

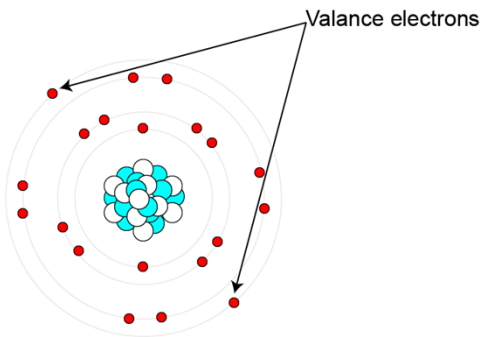
Na

Sodium

23.0

Mass number

- The **electrons** in the outermost energy level are called **valence electrons**.



- The periodic table is designed such that elements in the **same** group have the **same** number of **valence electrons**.

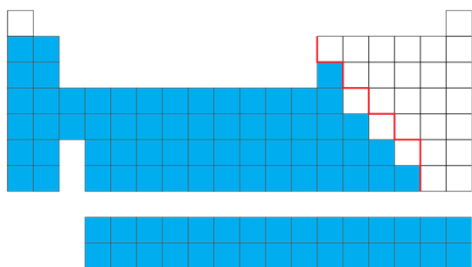
Group	1	2	3	4	5	6	7	8	9	10	11	12
Number of valence electrons	1	2	3	4	5	6	7	8	9	10	11	12

Group	13	14	15	16	17	18
Number of valence electrons	3	4	5	6	7	8

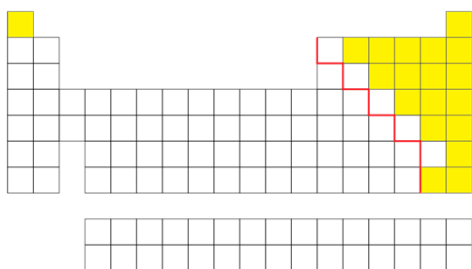
Note: Helium is an exception. It is in Group 18 but has two valence electrons.

- Atoms** are the smallest form of matter and make up **elements**.
- Elements** are made of a single type of atom and are represented on the **periodic table**.
- Elements** combine to form **molecules**.
- When a **molecule** is made of more than one kind of **element** it is called a **compound**.

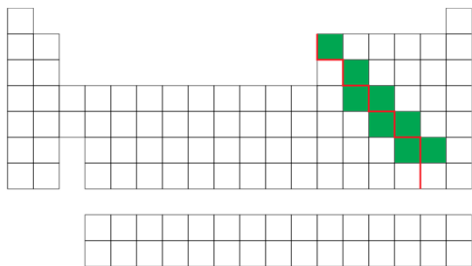
- Elements can be divided into two general categories: metals and nonmetals.
- Metals are to the left of the “staircase.”



- Nonmetals are to the right of the “staircase.”

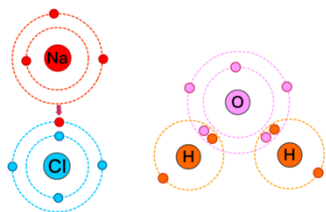


- Some elements right next to the “staircase” are called metalloids.
- They have properties of both metals and nonmetals.

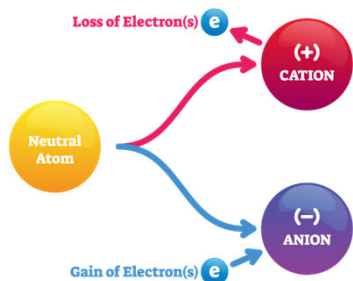


Why do Elements Make Molecules?

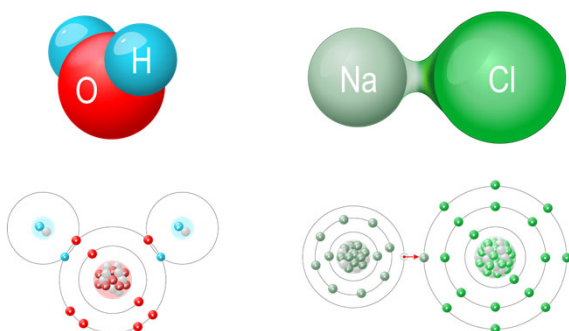
- Atoms of elements retain their nucleus, but **electrons** can be **transferred** or **shared**.



- Atoms form **ions** with a **positive** or **negative** charge.
- They form these **ions** by **gaining** or **losing** electrons.



- The **transfer** and **sharing** of electrons between atoms of different elements is known as a **chemical bond**.



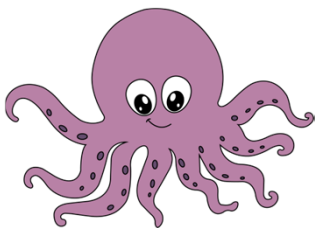
Periodic Table and Compounds

- We can use the periodic table to predict the **charge** on **ions**.
- **Atoms** tend to **gain** or **lose** electrons such that they have the **same** number of electrons as the nearest **Noble gas**.

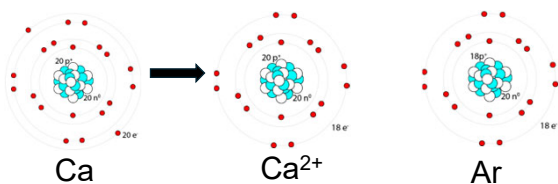


The Octet Rule

- Atoms prefer to have **eight** electrons in the **valence shell**. When atoms have fewer than eight electrons, they tend to react and form more stable compounds.

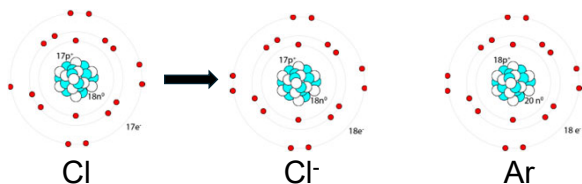


- **Metals** tend to **lose** electrons forming **positively** charged ions called **cations**.
- Calcium loses **2** electrons so that it has **18** electrons like argon. It therefore has a charge of **2+**.



• **Nonmetals** tend to **gain** electrons forming **negatively** charged ions called **anions**.

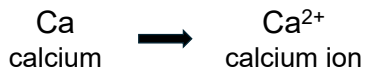
• Chlorine gains 1 electron so that it has 18 electrons like argon. It therefore has a charge of 1-.



Periodic Table With Ion																		
1 H ⁺ hydrogen																	17 He helium	
3 Li ⁺ lithium	4 Be ²⁺ beryllium																	10 Ne neon
11 Na ⁺ sodium	12 Mg ²⁺ magnesium	13 Al ³⁺ aluminum	14 Si silicon	15 P ³⁻ phosphide	16 S ²⁻ sulfide	17 Cl ⁻ chloride	18 Ar argon											
19 K ⁺ potassium	20 Ca ²⁺ calcium	21 Sc ³⁺ scandium	22 Ti ⁴⁺ titanium	23 V ⁵⁺ vanadium	24 Cr ³⁺ chromium	25 Mn ²⁺ manganese	26 Fe ²⁺ iron	27 Co ²⁺ cobalt	28 Ni ²⁺ nickel	29 Cu ⁺ copper	30 Zn ²⁺ zinc	31 Ga ³⁺ gallium	32 Ge ⁴⁺ germanium	33 As ³⁻ arsenide	34 Se ²⁻ selenide	35 Br ⁻ bromide	36 Kr krypton	
37 Rb ⁺ rubidium	38 Sr ²⁺ strontium	39 Y ³⁺ yttrium	40 Zr ⁴⁺ zirconium	41 Nb ⁵⁺ niobium	42 Mo ⁶⁺ molybdenum	43 Tc ⁷⁺ technetium	44 Ru ³⁺ ruthenium	45 Rh ³⁺ rhodium	46 Pd ²⁺ palladium	47 Ag ⁺ silver	48 Cd ²⁺ cadmium	49 In ³⁺ indium	50 Sn ⁴⁺ tin	51 Sb ³⁻ antimony	52 Te ²⁻ telluride	53 I ⁻ iodide	54 Xe xenon	
55 Cs ⁺ cesium	56 Ba ²⁺ barium	57 La ³⁺ lanthanum	58 Ce ³⁺ cerium	59 Pr ³⁺ praseodymium	60 Nd ³⁺ neodymium	61 Pm ³⁺ promethium	62 Sm ³⁺ samarium	63 Eu ³⁺ europium	64 Gd ³⁺ gadolinium	65 Tb ³⁺ terbium	66 Dy ³⁺ dysprosium	67 Ho ³⁺ holmium	68 Er ³⁺ erbium	69 Tm ³⁺ thulium	70 Yb ³⁺ ytterbium	71 Lu ³⁺ lutetium	72 Hf ⁴⁺ hafnium	
73 Ta ⁵⁺ tantalum	74 W ⁶⁺ tungsten	75 Re ⁷⁺ rhenium	76 Os ⁸⁺ osmium	77 Ir ⁴⁺ iridium	78 Pt ²⁺ platinum	79 Au ⁺ gold	80 Hg ²⁺ mercury	81 Tl ³⁺ thallium	82 Pb ²⁺ lead	83 Bi ³⁺ bismuth	84 Po ⁴⁻ polonium	85 At ⁻ astatine	86 Rn radon					
87 Fr ⁺ francium	88 Ra ²⁺ radium	89 Ac ³⁺ actinium	90 Th ⁴⁺ thorium	91 Pa ³⁺ protactinium	92 U ⁴⁺ uranium	93 Np ³⁺ neptunium	94 Pu ⁴⁺ plutonium	95 Am ³⁺ americium	96 Cm ³⁺ curium	97 Bk ³⁺ berkelium	98 Cf ³⁺ californium	99 Es ³⁺ einsteinium	100 Fm ³⁺ fermium	101 Md ³⁺ mendelevium	102 No ³⁺ nobelium	103 Lr ³⁺ lawrencium		

Naming Ions

- Cations do not have a special name.
- The name is just the name of the element.
- When calcium forms an ion, it is called a calcium ion.

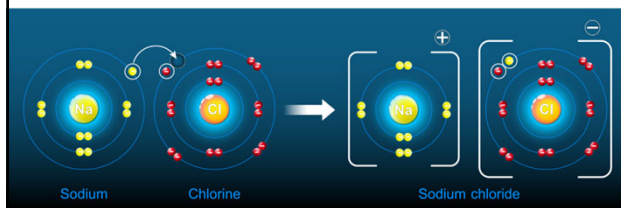


- Anions are named by using the first syllable of the element name and then adding the suffix “ide.”
- When oxygen forms an ion, it is called oxide.

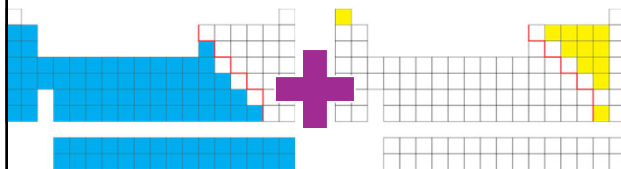


Ionic Compounds

- **Ionic** compounds form when atoms **transfer** electrons producing **ions**.
- The oppositely charged ions are attracted to each other forming an **ionic bond**.



- When a **metal** is combined with one or more **nonmetals**, the compound is usually **ionic**.

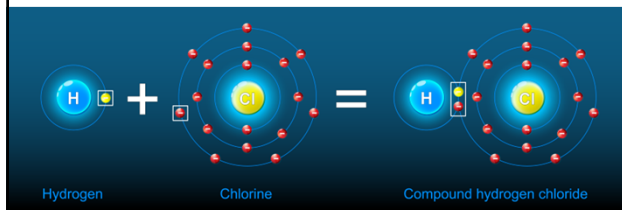


Naming Ionic Compounds

- Chemical compounds are named according to IUPAC (International Union of Pure and Applied Chemistry) rules.
- Simple ionic compounds are named by using the names of the cation and anion.
 - NaCl is sodium chloride.
 - Al₂O₃ is aluminum oxide.

Molecular Compounds

- **Molecular** or **covalent** compounds form when atoms **share** electrons.
- Each pair of electrons shared is called a covalent bond.

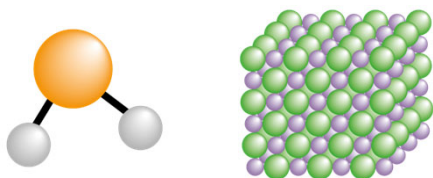


- **Molecular**, or covalent **compounds** are usually formed by a combination of **nonmetals**.



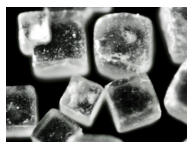
Comparing Ionic and Molecular Compounds

- We can often identify ionic or molecular compounds based on their physical properties.



- Under normal conditions, ionic compounds usually exist as solids and molecular compounds can be either solids, liquids, or gasses.

NaCl (table salt) is an ionic compound.



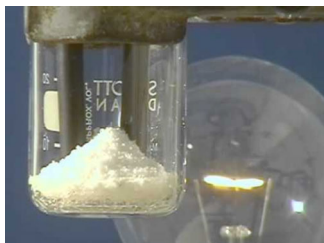
C₁₂H₂₂O₁₁ (sugar), H₂O (water), and N₂O (laughing gas) are molecular compounds.



- Ionic compounds tend to have higher **melting points** than molecular compounds.

Ionic Compound	Name	Common Name	Melting Point (°C)
NaCl	Sodium chloride	Table salt	800.7
MgCl ₂	Magnesium chloride	Road salt	712
KCl	Potassium chloride	No-sodium salt	770
Molecular Compound	Name	Common Name	Melting Point (°C)
H ₂ O	Dihydrogen monoxide	Water	0
CO ₂	Carbon dioxide	Carbon dioxide	-56.5
CH ₄	Methane	Natural gas	-182

- **Ionic** compounds will **conduct** electricity when they are a liquid or if dissolved in water. **Molecular** compounds are poor **conductors**.



<https://youtu.be/ePzEVPDyJV8>

Predicting the Formula of an Ionic Compound

- When a **cation** and **anion** combine to form an ionic compound, the resulting charge must be **zero**.
- A sodium ion has a charge of **1+** and a chloride ion has a charge of **1-**.
 - Therefore, the resulting compound will have **one** sodium ion (**Na⁺**) and **one** chloride ion (**Cl⁻**).
 - The resulting formula is **NaCl**.

- A calcium ion has a charge of **2+** and a chloride ion has a charge of **1-**.
 - Therefore, the resulting compound will have **one** calcium ion (**Ca²⁺**) and **two** chloride ions (**Cl⁻**).
 - The resulting formula is **CaCl₂**.
- A sodium ion has a charge of **1+** and an oxide ion has a charge of **2-**.
 - Therefore, the resulting compounding will have **two** sodium ions (**Na⁺**) and **one** oxide ion (**O²⁻**).
 - The resulting formula is **Na₂O**.
