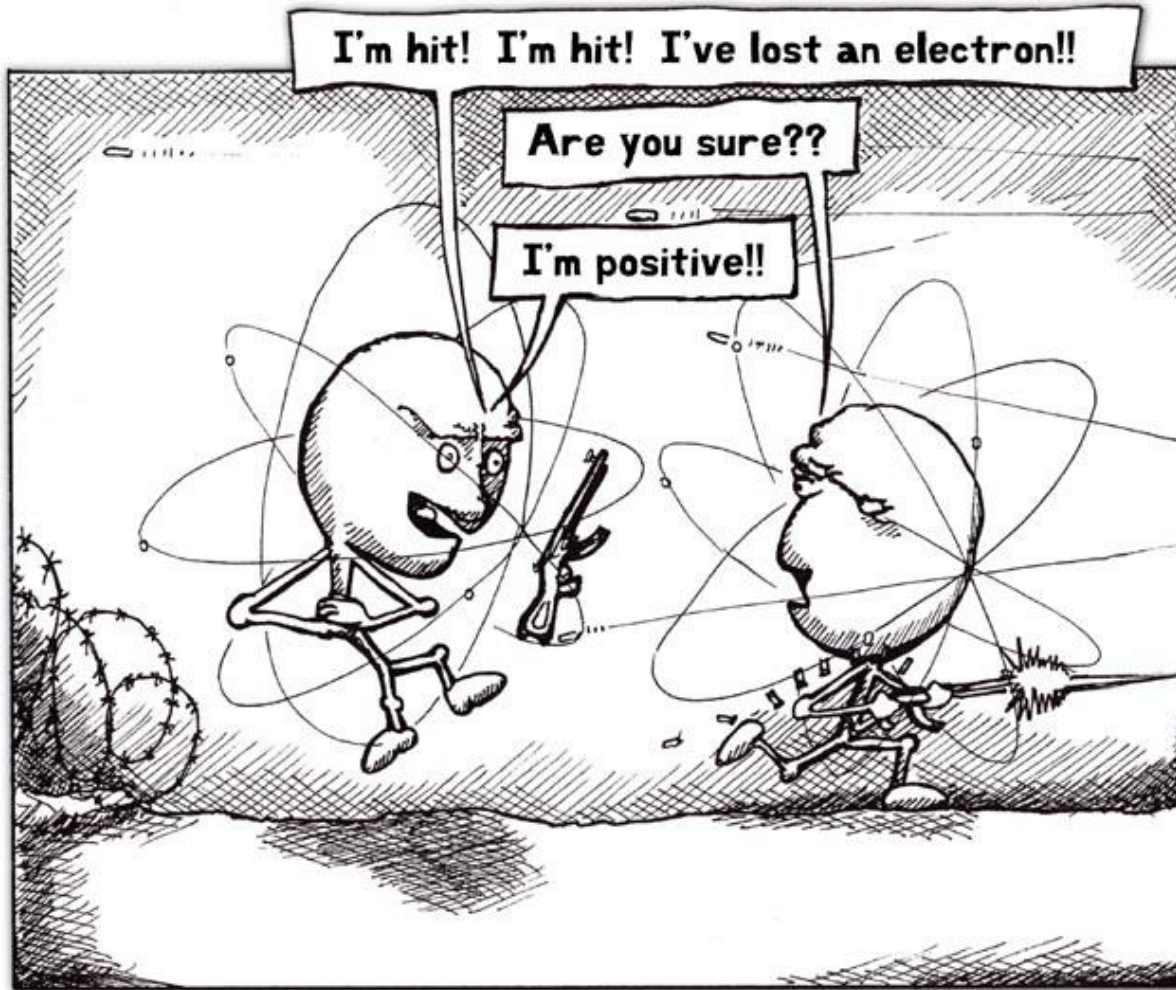


## 2.2 Periodic Table

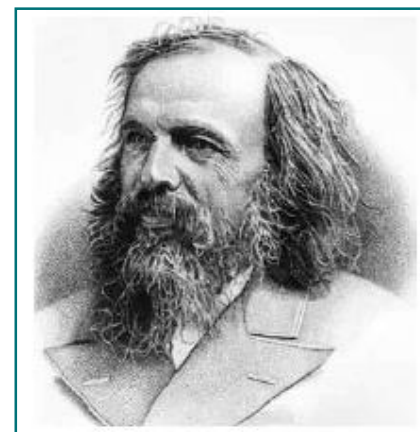


Another casualty in the War of the Atoms

- Hand in lab from last class
- Notes

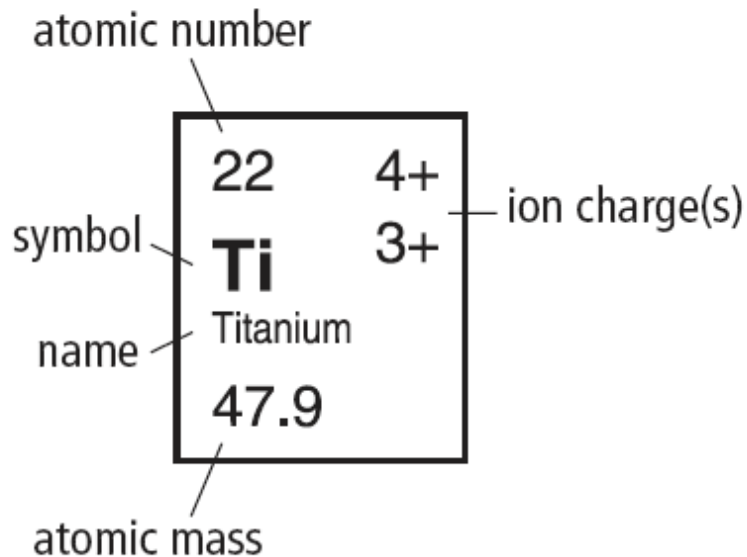
## 2.2 Periodic Table

- Origin of the periodic table
  - Chemists in the 10th century wished to organize elements
  - Attempts focused on grouping elements with similar properties
  - In 1867, Dimitri Mendeleev found patterns in the elements and organized them into table
  - The resulting table had holes for elements not yet discovered



# Periodic Table

- The Periodic Table provides information on the physical and chemical properties of elements



The diagram shows a single element box from the periodic table for Titanium (Ti). The box is a square divided into four quadrants. The top-left quadrant contains the atomic number '22'. The top-right quadrant contains two ion charges, '4+' and '3+', stacked vertically. The bottom-left quadrant contains the element symbol 'Ti'. The bottom-right quadrant contains the element name 'Titanium' and the atomic mass '47.9'. Labels with leader lines point to each of these five components: 'atomic number' points to '22', 'symbol' points to 'Ti', 'name' points to 'Titanium', 'atomic mass' points to '47.9', and 'ion charge(s)' points to the '4+' and '3+' charges.

atomic number	22	4+	ion charge(s)
symbol	Ti	3+	
name	Titanium		
atomic mass	47.9		

**Atomic Mass** - mass of average atom (including its isotopes) and is calculated using the number of protons (atomic number) and neutrons. We always round to the nearest whole number for calculations.

**Atomic Number** - number of protons

**Ion Charge** - electric charge that forms when an atom gains or loses electrons

# Isotopes

- Isotopes are different atoms of a particular element that have the same number of protons but different numbers of neutrons.
  - This means they have a different mass number
- Carbon-12 ← number of neutrons
- Carbon-13
- Carbon-14

# Periodic Table

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 <b>H</b> Hydrogen 1.0																	2 <b>He</b> Helium 4.0
2 <b>Li</b> Lithium 6.9	3 <b>Be</b> Beryllium 9.0																
3 <b>Na</b> Sodium 23.0	4 <b>Mg</b> Magnesium 24.3																
4 <b>K</b> Potassium 39.1	5 <b>Ca</b> Calcium 40.1	6 <b>Sc</b> Scandium 45.0	7 <b>Ti</b> Titanium 47.9	8 <b>V</b> Vanadium 50.9	9 <b>Cr</b> Chromium 52.0	10 <b>Mn</b> Manganese 54.9	11 <b>Fe</b> Iron 55.8	12 <b>Co</b> Cobalt 58.9	13 <b>Ni</b> Nickel 58.7	14 <b>Cu</b> Copper 63.5	15 <b>Zn</b> Zinc 65.4	16 <b>Ga</b> Gallium 69.7	17 <b>Ge</b> Germanium 72.6	18 <b>As</b> Arsenic 74.9	19 <b>Se</b> Selenium 79.0	20 <b>Br</b> Bromine 79.9	21 <b>Kr</b> Krypton 83.8
5 <b>Rb</b> Rubidium 85.5	6 <b>Sr</b> Strontium 87.6	7 <b>Y</b> Yttrium 88.9	8 <b>Zr</b> Zirconium 91.2	9 <b>Nb</b> Niobium 92.9	10 <b>Mo</b> Molybdenum 95.9	11 <b>Tc</b> Technetium (98)	12 <b>Ru</b> Ruthenium 101.1	13 <b>Rh</b> Rhodium 102.9	14 <b>Pd</b> Palladium 106.4	15 <b>Ag</b> Silver 107.9	16 <b>Cd</b> Cadmium 112.4	17 <b>In</b> Indium 114.8	18 <b>Sn</b> Tin 118.7	19 <b>Sb</b> Antimony 121.8	20 <b>Te</b> Tellurium 127.6	21 <b>I</b> Iodine 126.9	22 <b>Xe</b> Xenon 131.3
6 <b>Cs</b> Cesium 132.9	7 <b>Ba</b> Barium 137.3	8 <b>La</b> Lanthanum 138.9	9 <b>Hf</b> Hafnium 178.5	10 <b>Ta</b> Tantalum 180.9	11 <b>W</b> Tungsten 183.8	12 <b>Re</b> Rhenium 186.2	13 <b>Os</b> Osmium 190.2	14 <b>Ir</b> Iridium 192.2	15 <b>Pt</b> Platinum 195.1	16 <b>Au</b> Gold 197.0	17 <b>Hg</b> Mercury 200.6	18 <b>Tl</b> Thallium 204.4	19 <b>Pb</b> Lead 207.2	20 <b>Bi</b> Bismuth 209.0	21 <b>Po</b> Polonium (209)	22 <b>At</b> Astatine (210)	23 <b>Rn</b> Radon (222)
7 <b>Fr</b> Francium (223)	8 <b>Ra</b> Radium (226)	9 <b>Ac</b> Actinium (227)	10 <b>Rf</b> Rutherfordium (261)	11 <b>Db</b> Dubnium (262)	12 <b>Sg</b> Seaborgium (263)	13 <b>Bh</b> Bohrium (262)	14 <b>Hs</b> Hassium (265)	15 <b>Mt</b> Meitnerium (266)	16 <b>Ds</b> Darmstadtium (281)	17 <b>Rg</b> Roentgenium (272)	18 <b>Uub*</b> Ununbium (285)	19 <b>Uut*</b> Ununtrium (284)	20 <b>Uuq*</b> Ununquadium (289)	21 <b>Uup*</b> Ununpentium (288)	22 <b>Uuh*</b> Ununhexium (292)		

metal

metalloid

non-metal

Atomic Number  
Symbol  
Name  
Atomic Mass

22  
Ti  
Titanium  
47.9

Ion charge(s)

\* Temporary names

The left side of the table forms positive ions. The right side negative

58 <b>Ce</b> Cerium 140.1	59 <b>Pr</b> Praseodymium 140.9	60 <b>Nd</b> Neodymium 144.2	61 <b>Pm</b> Promethium (145)	62 <b>Sm</b> Samarium 150.4	63 <b>Eu</b> Europium 152.0	64 <b>Gd</b> Gadolinium 157.3	65 <b>Tb</b> Terbium 158.9	66 <b>Dy</b> Dysprosium 162.5	67 <b>Ho</b> Holmium 164.9	68 <b>Er</b> Erbium 167.3	69 <b>Tm</b> Thulium 168.9	70 <b>Yb</b> Ytterbium 173.0	71 <b>Lu</b> Lutetium 175.0
80 <b>Th</b> Thorium 232.0	91 <b>Pa</b> Protactinium 231.0	92 <b>U</b> Uranium 238.0	93 <b>Np</b> Neptunium (237)	94 <b>Pu</b> Plutonium (244)	95 <b>Am</b> Americium (243)	96 <b>Cm</b> Curium (247)	97 <b>Bk</b> Berkelium (247)	98 <b>Cf</b> Californium (251)	99 <b>Es</b> Einsteinium (252)	100 <b>Fm</b> Fermium (257)	101 <b>Md</b> Mendelevium (258)	102 <b>No</b> Nobelium (259)	103 <b>Lr</b> Lawrencium (262)

# Metals, Non-metals, Metalloids

	State at Room Temperature	Appearance	Conductivity	Malleability and Ductility
Metals	<ul style="list-style-type: none"><li>• solid except for mercury (a liquid)</li></ul>	<ul style="list-style-type: none"><li>• shiny lustre</li></ul>	<ul style="list-style-type: none"><li>• good conductors of heat and electricity</li></ul>	<ul style="list-style-type: none"><li>• malleable</li><li>• ductile</li></ul>
Non-metals	<ul style="list-style-type: none"><li>• some gases</li><li>• some solids</li><li>• only bromine is a liquid</li></ul>	<ul style="list-style-type: none"><li>• not very shiny</li></ul>	<ul style="list-style-type: none"><li>• poor conductors of heat and electricity</li></ul>	<ul style="list-style-type: none"><li>• brittle</li><li>• not ductile</li></ul>
Metalloids	<ul style="list-style-type: none"><li>• solids</li></ul>	<ul style="list-style-type: none"><li>• can be shiny or dull</li></ul>	<ul style="list-style-type: none"><li>• may conduct electricity</li><li>• poor conductors of heat</li></ul>	<ul style="list-style-type: none"><li>• brittle</li><li>• not ductile</li></ul>

# Periods and Families

- Each horizontal row in the periodic table is a **period**
- Vertical columns form groups or **chemical families**

- **Alkali metals** - highly reactive group 1
- **Alkaline earth metals** - group 2, burn in air if heated
- **Halogens** - group 17, highly reactive non-metals
- **Noble gases** - group 18, stable and unreactive non-metals

1 H							2 He
3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn

alkali metals      alkaline earth metals      halogens      noble gases



# Some questions

- State how many protons are present in each of the following atoms
  - Silicon chromium and iodine
- What is the most common charge of chromium?

# Task for at home

- What is the difference between a bohr model and an electron cloud model?
  - Is one more correct than the other?
  - Sketch a diagram of each type of model of the element you are studying for your poster.
- Lab/project time.