CHEMISTRY II

1. ELEMENTS
2. PERIODIC TABLE
3. PROPERTIES OF ELEMENTS

ELEMENTS

Elements are…

- The basic building blocks of matter
- Made up of one type of atom (cannot be broken down further)
- About 90 elements occur naturally (carbon, silver, oxygen)
- Some elements are synthesized in labs
- Have varying properties

ELEMENTS

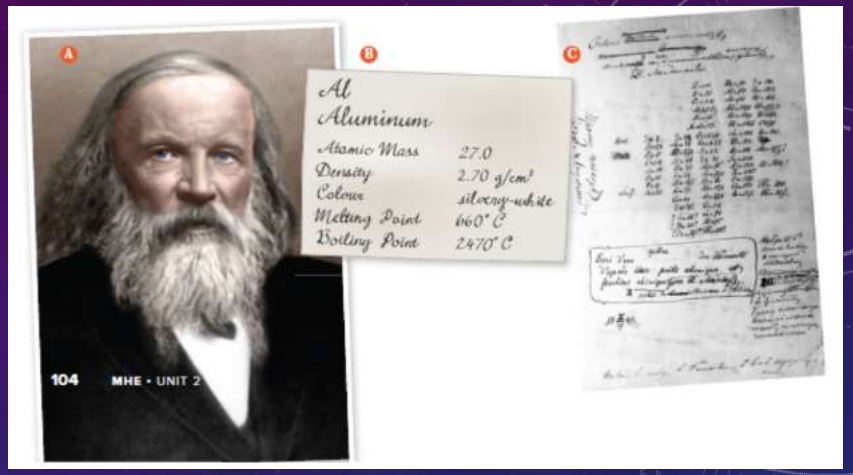
Each element has a

- **Chemical name**
  - Based on Latin words, countries, names of famous scientists
- **Chemical symbol**
  - One or two letters (first letter is capitalized)
  - Synthetic or unnamed elements have placeholder names or three-letter symbols

MENDELEEV'S PERIODIC TABLE

Video:
https://www.youtube.com/watch?v=fPnwBITSmgU&ab_channel=TED-Ed

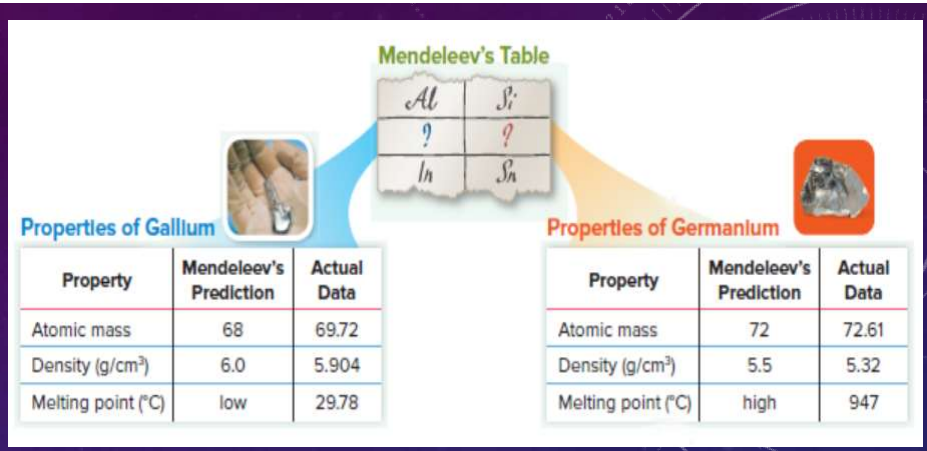
MENDELEEV'S PERIODIC TABLE



1860s: Dmitri Mendeleev

- Looked at different ways to organize the elements
- Wrote properties of elements on cards so that he could rearrange them and compare properties ("chemical solitaire")
- Properties included atomic mass (average mass of an atom of an element), density, and melting point.

MENDELEEV'S PERIODIC TABLE



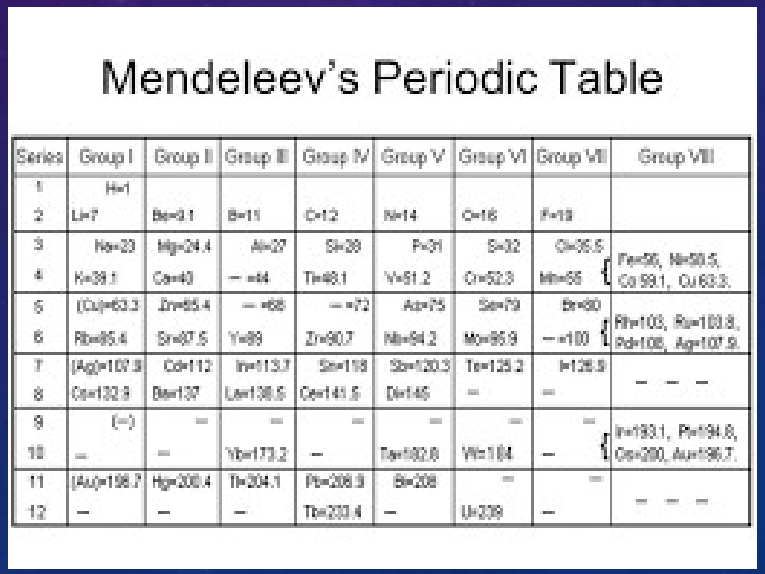
Mendeleev's periodic table:

- Ordered the elements by increasing atomic mass.
- Grouped elements into "families" based on similar properties (density, melting point)
- Left gaps in his periodic table to predict the existence of elements not yet found yet
  - These missing elements would have properties similar to other elements in the same families.

MENDELEEV'S PERIODIC TABLE

Mendeleev's periodic table was ordered by increasing atomic mass:

- Did not work perfectly – some elements were out of order so they would fit in a family that had similar properties



Mendeleev's Periodic Table

Series	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII
1	H=1							
2	Li=7	Be=9.1	B=11	C=12	N=14	O=16	F=19	
3	Na=23	Mg=24.4	Al=27	Si=28	P=31	S=32	Cl=35.5	
4	K=39.1	Ca=40	— =44	Ti=48.1	V=51.2	Cr=52.3	Mn=55	Fe=56, Ni=59.5, Co 59.1, Cu 63.3.
5	(Cu)=63.3	Zn=65.4	— =68	— =72	As=75	Se=79	Br=80	
6	Rb=85.4	Sr=87.5	Y=89	Zr=90.7	Nb=94.2	Mo=95.9	— =100	Ru=103, Rh=103.8, Pd=106, Ag=107.9.
7	(Ag)=107.9	Cd=112	In=113.7	Sn=118	Sb=120.3	Te=125.2	I=126.9	
8	Cs=132.9	Ba=137	La=138.5	Ce=141.5	Di=145	—	—	— — —
9	(—)	—	—	—	—	—	—	
10	—	—	Yb=173.2	—	Ta=182.6	W=184	—	Ir=193.1, Pt=194.8, Os=200, Au=196.7.
11	(Au)=196.7	Hg=200.4	Tl=204.1	Pb=206.9	Bi=208	—	—	
12	—	—	—	Th=233.4	—	U=239	—	— — —

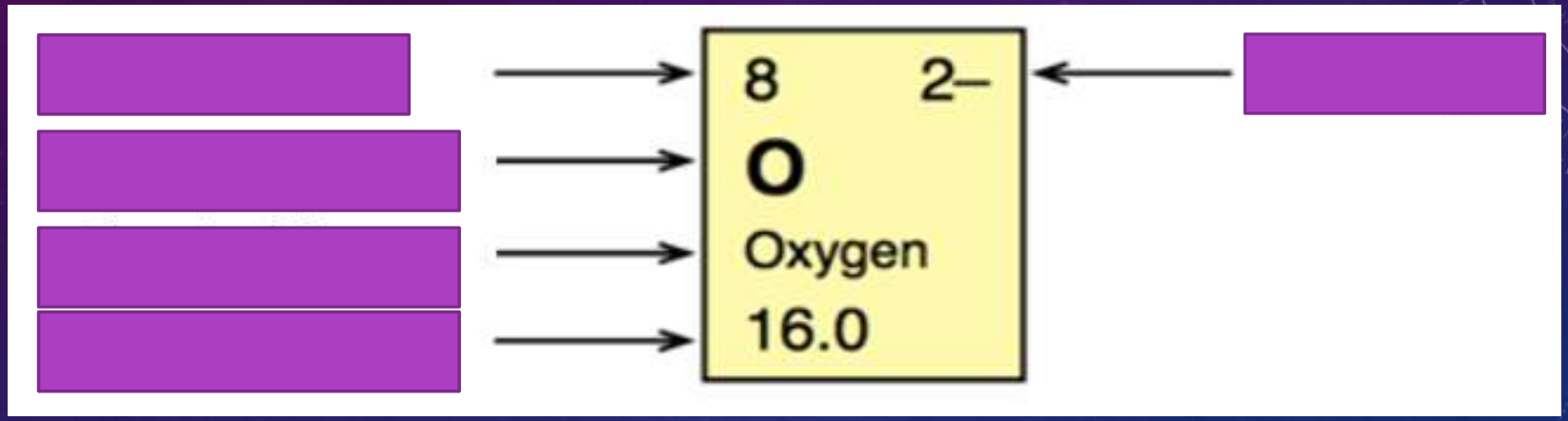
MODERN PERIODIC TABLE

Modern periodic table is ordered by increasing **atomic number.**

- Henry Moseley: scientist that determined an element's atomic number (the number of protons in an atom)
- When elements are arranged according to increasing atomic number, the elements fit perfectly and do not require re-ordering

MODERN PERIODIC TABLE

Video:
https://www.youtube.com/watch?v=rz4Dd1I_fX0&ab_channel=AsapSCIENCE


8
2–
O
Oxygen
16.0

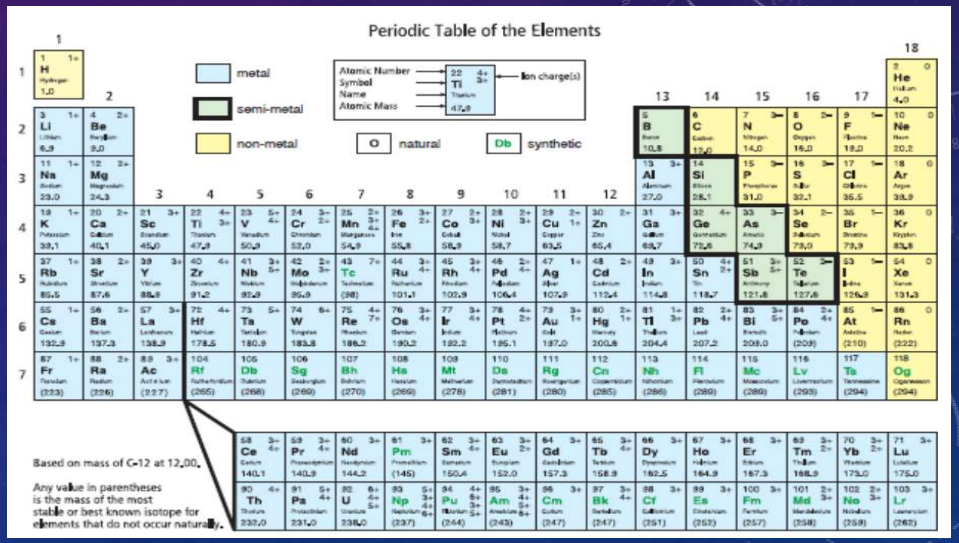
MODERN PERIODIC TABLE

We can use the information from the periodic table in order to find information about subatomic particles.

Name	Charge	Location	To find the number of particles for each elements, look at the…
Proton	Positive	Nucleus	Atomic number
Neutron	Neutral	Nucleus	Atomic mass – atomic number
Electron	Negative	Electron shells/rings	Atomic number

METALS

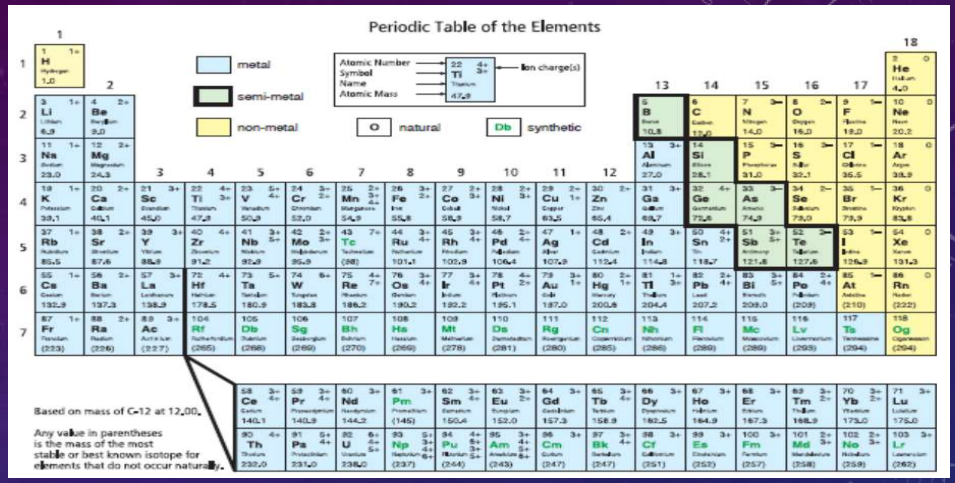
On the periodic table, there are three categories shown on the periodic table:



<u>Metal</u>:

- <u>Shiny</u> and hard (typically)
- <u>Malleable</u> and ductile
- <u>Conducts</u> electricity and heat
- Found to the left of the <u>zigzag</u> line on the periodic table

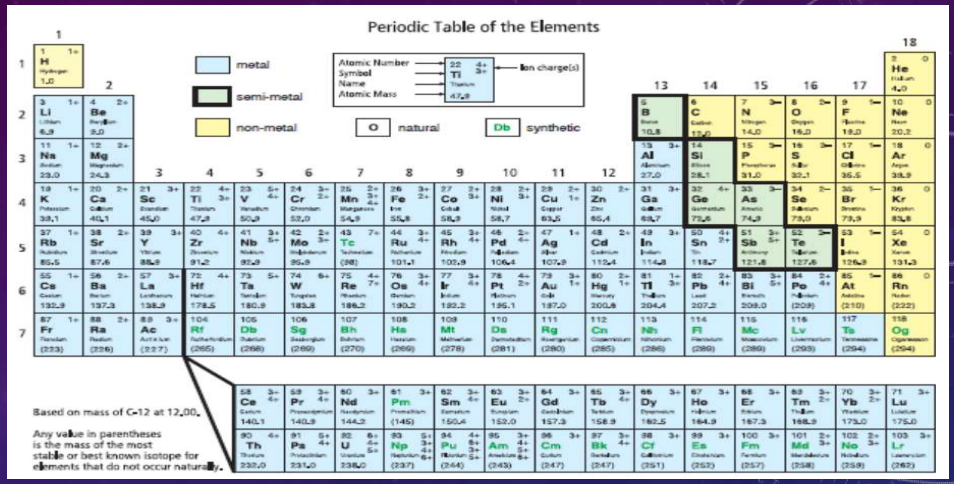
NON-METALS



<u>Non-metal</u>:

- Not shiny, malleable, or <u>ductile</u>
- <u>Poor</u> conductor of electricity and heat
- Found to the <u>right</u> of the zigzag line on the periodic table
- Generally <u>gases</u> or brittle, dull solids.

SEMI-METALS (METALLOIDS)



<u>Semi-metals</u> (Metalloids):

- Have physical and chemical properties of <u>both</u> metals and non-metals
  - <u>Shiny</u> (like metals)
  - <u>Brittle</u> and *not* ductile (like non-metals)
  - Poor conductors of heat and <u>electricity</u> (like non-metals)

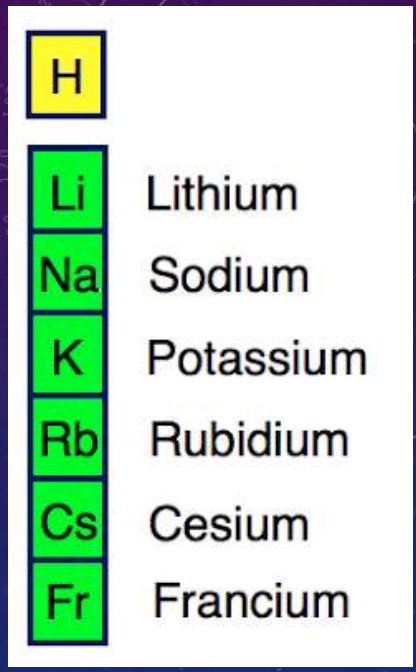
MODERN PERIODIC TABLE

The modern periodic table can also be organized into:

- **Groups (Family)** (1-18): A vertical column of elements
- **Periods** (1-7): A horizontal row of elements

ALKALI METALS (GROUP 1)

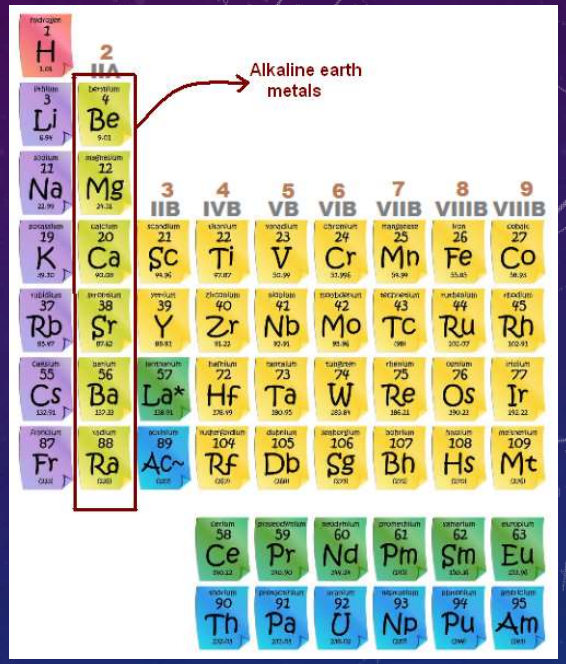
- Shiny and soft
- Highly reactive with water and oxygen (often stored in a non-reactive liquid such as oil)



Video:
https://www.youtube.com/watch?v=m55kgyApYrY&ab_channel=scientist303

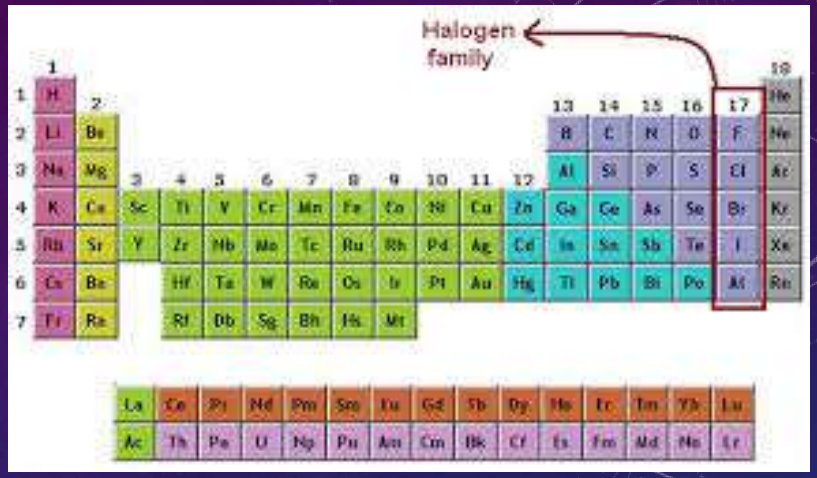
ALKALINE EARTH METALS (GROUP 2)

- Shiny and soft (but not as soft as alkali metals)
- Highly reactive (but not as reactive as alkali metals)



Video:
https://www.youtube.com/watch?v=O6DaCYKh77E&ab_channel=DavidRead

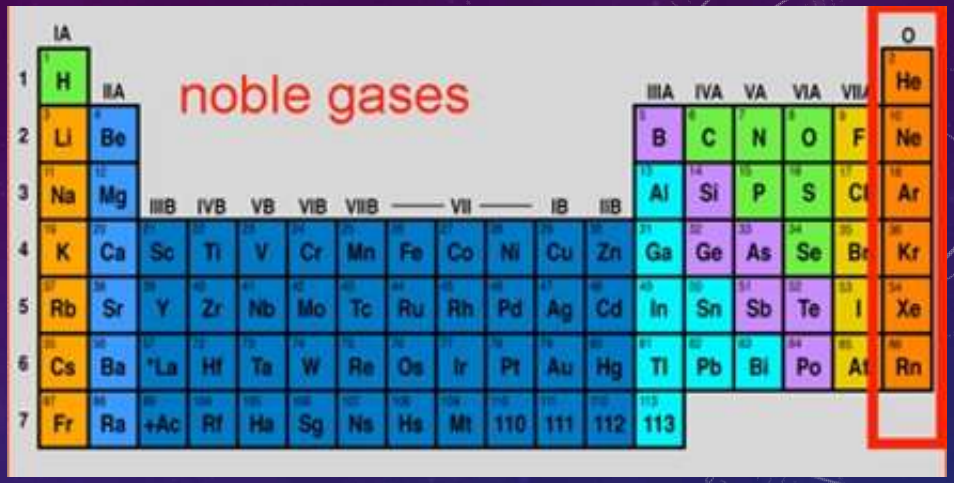
HALOGENS (GROUP 17)



- Highly reactive (therefore usually found in nature as part of compounds)

Video:
https://www.youtube.com/watch?v=u2ogMUDBaf4&ab_channel=OpenLearnfromTheOpenUniversity

NOBLE GAS (GROUP 18)



- Odourless, colourless gases
- Least reactive of all of the elements
  - Helium and neon never form compounds
  - Other noble gases form compounds with great difficulty