

Unit 2:  
The Periodic Table &  
Periodic Law

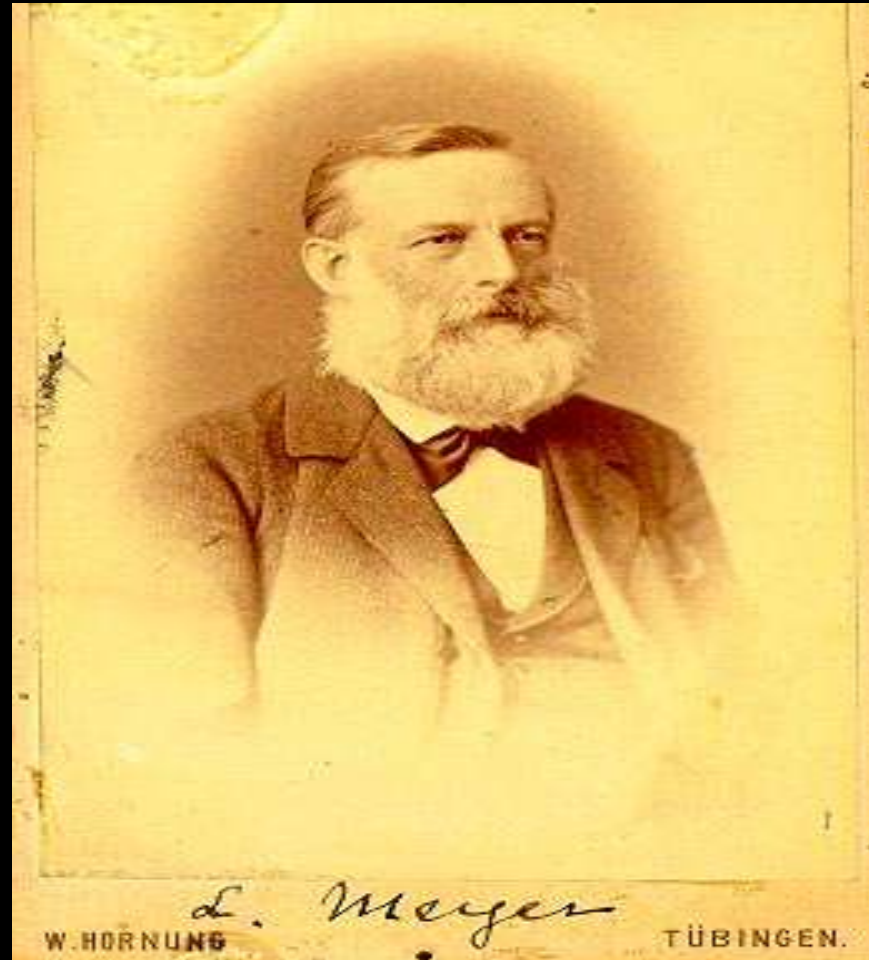
# Who developed the Periodic Table?

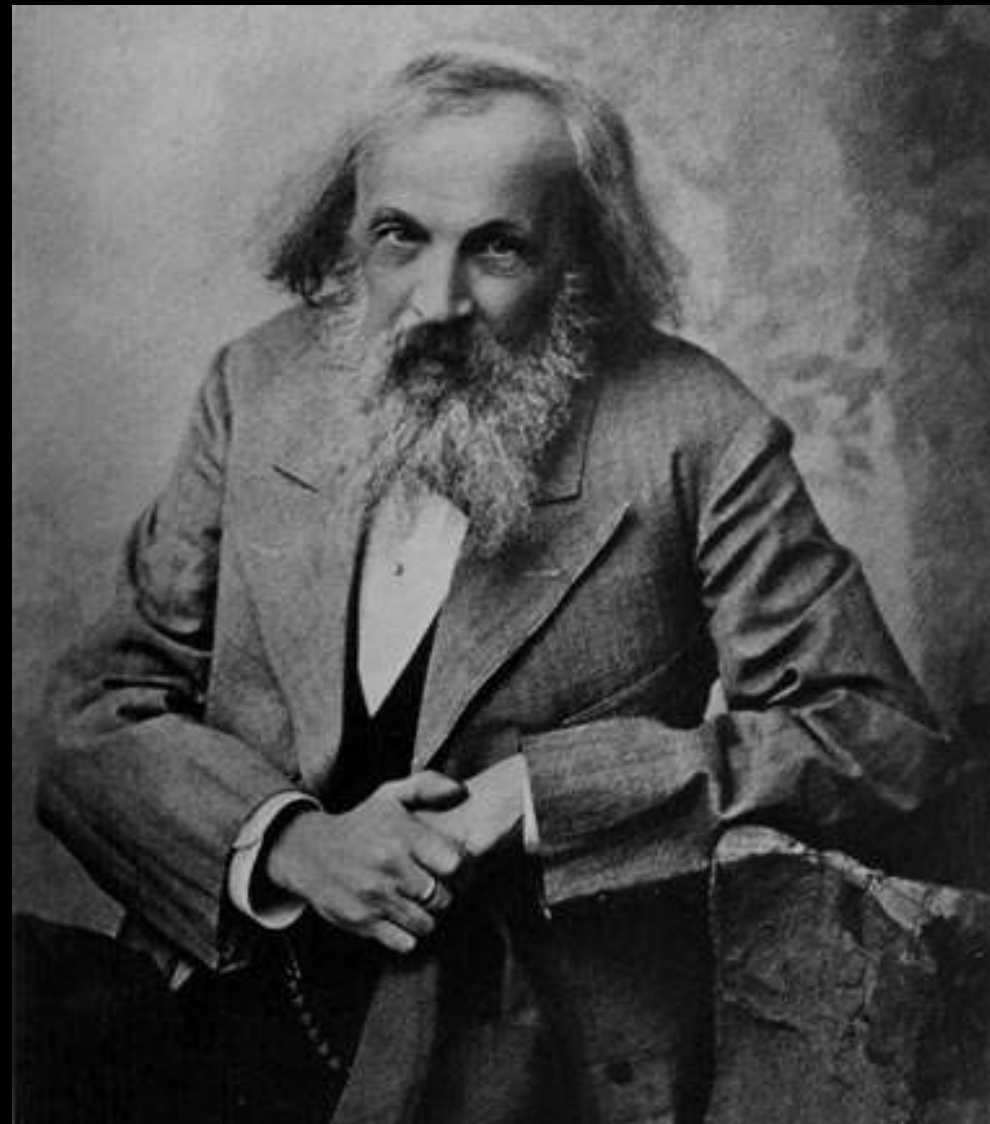
Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII
H = 1							
Li = 7	Be = 9.4	B = 11	C = 12	N = 14	O = 16	F = 19	
Na = 23	Mg = 24	Al = 27.3	Si = 28	P = 31	S = 32	Cl = 35.5	Fe = 56, Co = 59, Ni = 59, Cu = 63.
K = 39	Ca = 40	— = 44	Ti = 48	V = 51	Cr = 52	Mn = 55	
(Cu = 63)	Zn = 65	— = 68	— = 72	As = 75	Se = 78	Br = 80	Ru = 104, Rh = 104, Pd = 106, Ag = 108.
Rb = 85	Sr = 87	Yt = 88	Zr = 90	Nb = 94	Mo = 96	— = 100	
(Ag = 108)	Cd = 112	In = 113	Sn = 118	Sb = 122	Te = 125	I = 127	
Cs = 133	Ba = 137	Di = 138	Ce = 140	—	—	—	
(—)	—	—	—	—	—	—	
—	—	Er = 178	La = 180	Ta = 182	W = 184	—	Os = 195, Ir = 197, Pt = 198, Au = 199.
(Au = 199)	Hg = 200	Tl = 204	Pb = 207	Bi = 208	—	—	
—	—	—	Th = 231	—	U = 240	—	

# Periodic Table History

German Julius Lothar **Meyer** (1830-1895) and Russian Dmitri Ivanovich **Mendeleev** (1834-1907) demonstrated a connection between **atomic mass** and **elemental properties**.

# Julius Lothar Meyer





## The Periodic Table Continued

- Mendeleev is given credit for the periodic table **because he emphasized the use of the table to predict new elements and their properties**
- In 1872, Dmitri Mendeleev developed the first periodic table based on **increasing atomic mass**

# Periodic Table Continued

In 1913, Henry Moseley (British) arranged the table according to atomic number



# The Modern Periodic Table

- Periodic Law: The physical and chemical properties of elements are periodic functions of their atomic numbers



# The Periodic Table

The image shows a schematic representation of the periodic table. It consists of a main grid of 18 columns and 7 rows. The first two columns are on the left, and the last two are on the right. The middle 14 columns are split into two blocks of 7 columns each, with a gap between them. The bottom row of the main grid has four cells shaded gray, representing the elements from atomic number 113 to 118. A red arrow points from the bottom-right corner of the main grid to the top-right corner of a separate 2x14 grid located below it, which represents the eighth period of the periodic table.

All elements up to #118 have been synthesized in lab by research scientists.

# The Modern Periodic Table

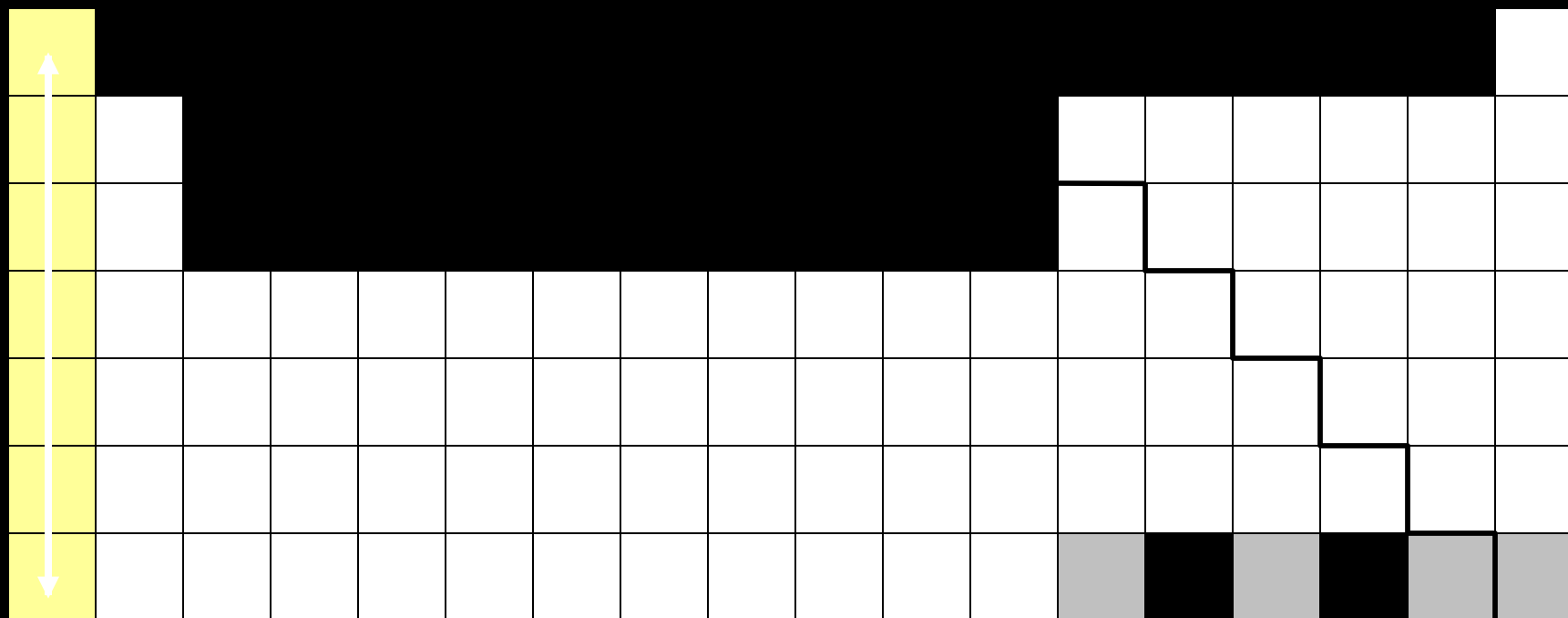
- The Modern Periodic Table is divided into:
- A. **Periods**: horizontal rows of elements
- There are **7 periods**



# Parts of the Periodic Table

- B. Vertical columns are called **Groups or Families**
- There are **18** groups
- Groups are numbered in two ways:
  - numeric 1-18
  - using A or B and a numeral

Vertical columns are called groups or families.



Atomic number

Symbol

Element name

Atomic mass



Different periodic tables provide different amounts of info and in different orders

Notice that there are two numbering systems for the families:

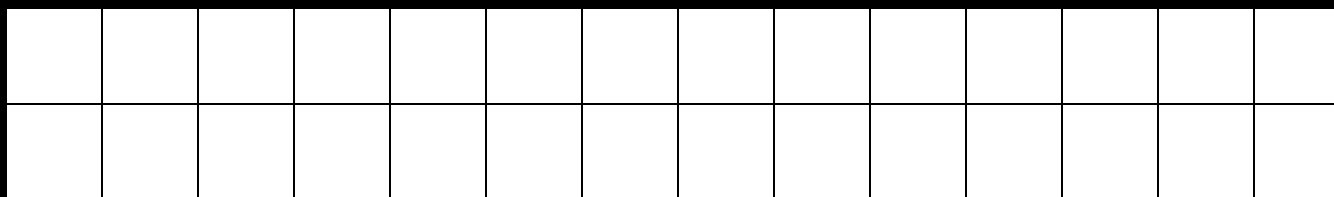
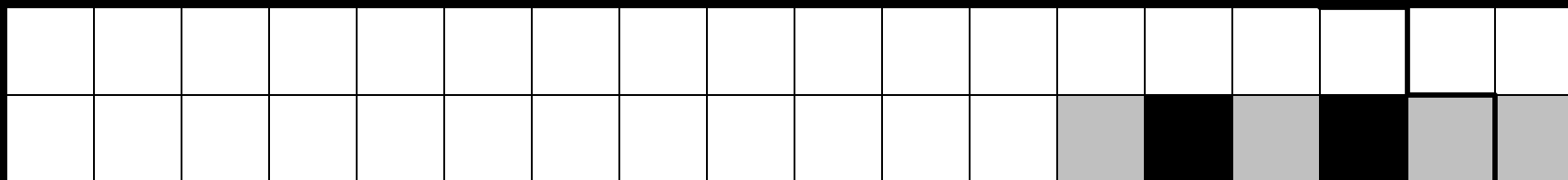
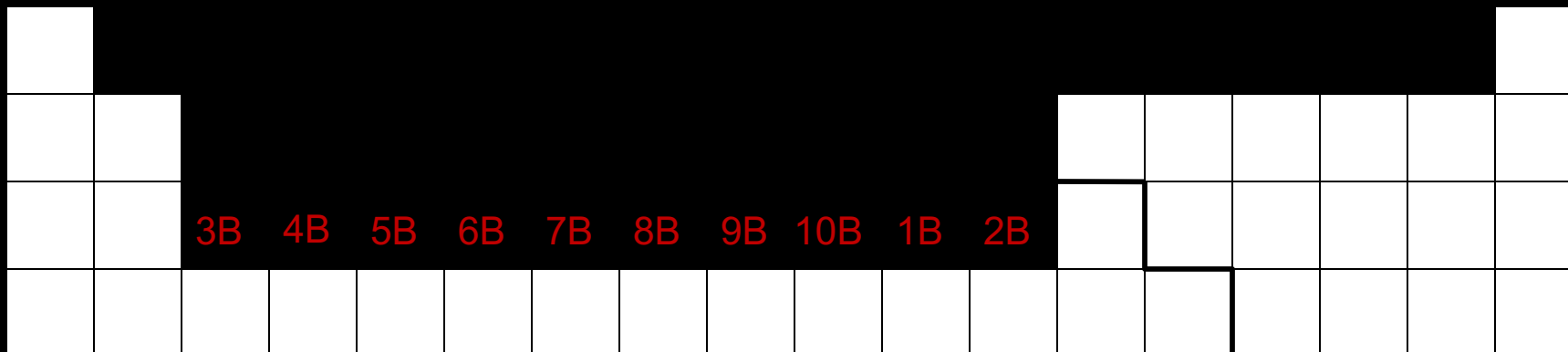
A and B groups distinction

IUPAC consecutive numbering system





# “B” Columns





## Groups and Families

- Families/Groups are divided into certain columns based on **electron configuration** and because of their **chemical and physical properties**
- The column is based on the **last energy levels** to be filled

## Families

- Group 1

**Alkaline**

- Group 2

**Alkali Earth Metals**

- Group 3-12

**Transition Metals**

- Metalloids

**Boron, Silicon, Germanium, Arsenic,  
Antimony, Tellurium, Polonium**

## Families Continued

### Group 17: Halogens

- Halogens means salt former
- Very reactive, never found alone

### Group 18: Noble Gases

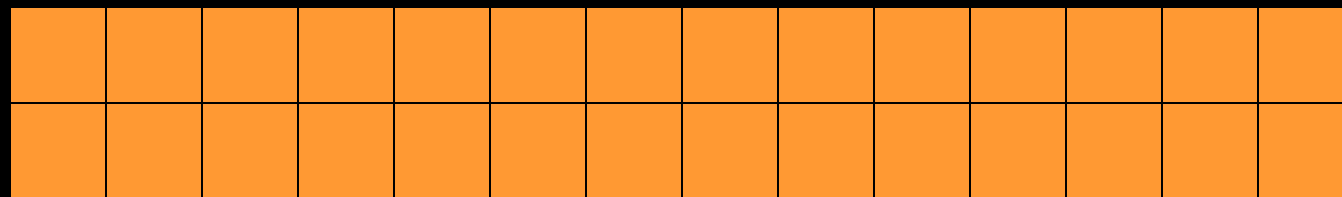
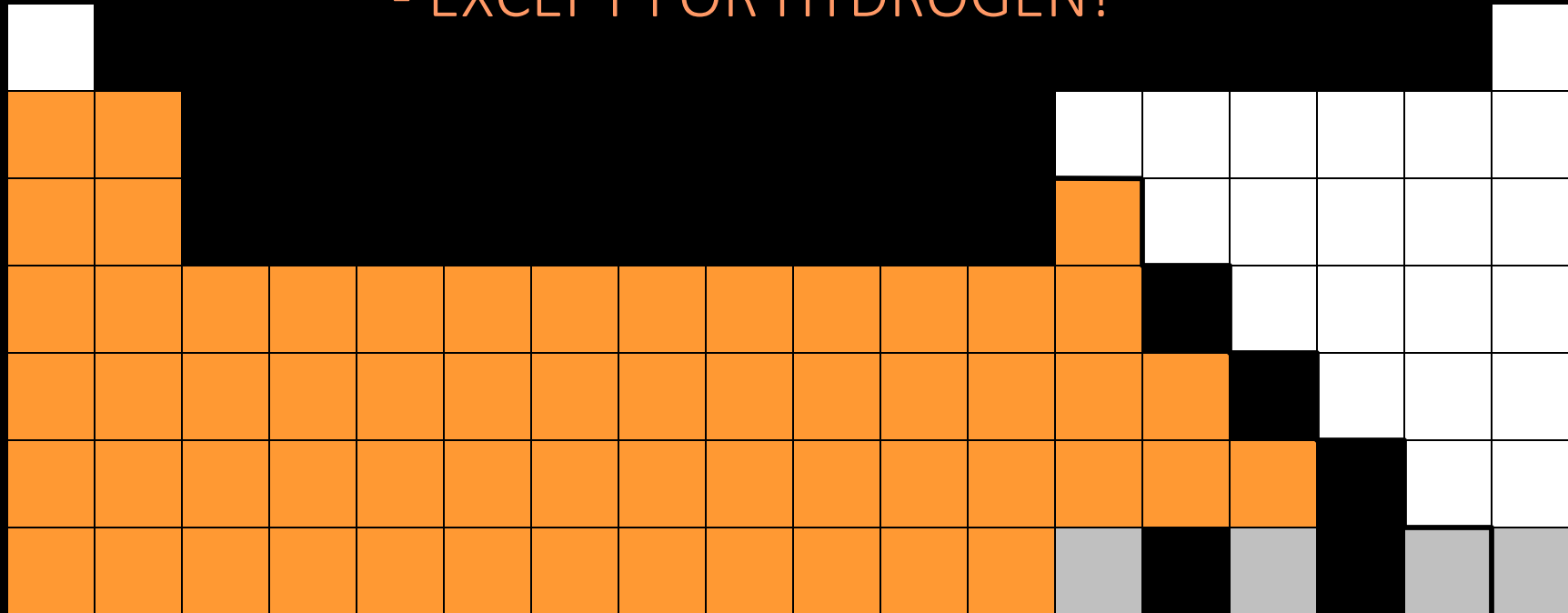
- Generally do not form compounds

## Families Continued

- Lanthanides: Elements 57-71
- Actinides: Elements 89-103
- Most of these are rare
- Many are synthetic (man-made)
- Many are radioactive

There are three types of elements on the periodic table.

**Metals** - elements to the left of the staircase  
- EXCEPT FOR HYDROGEN!



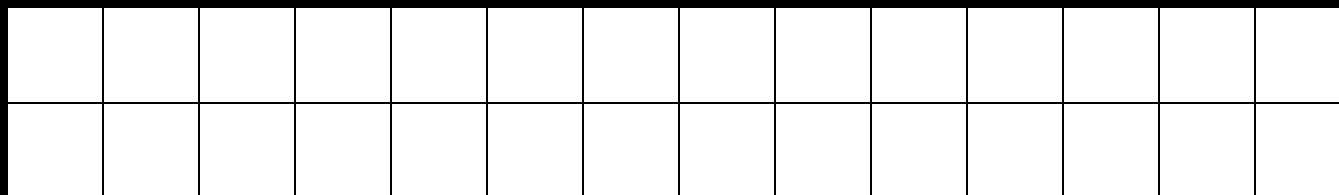
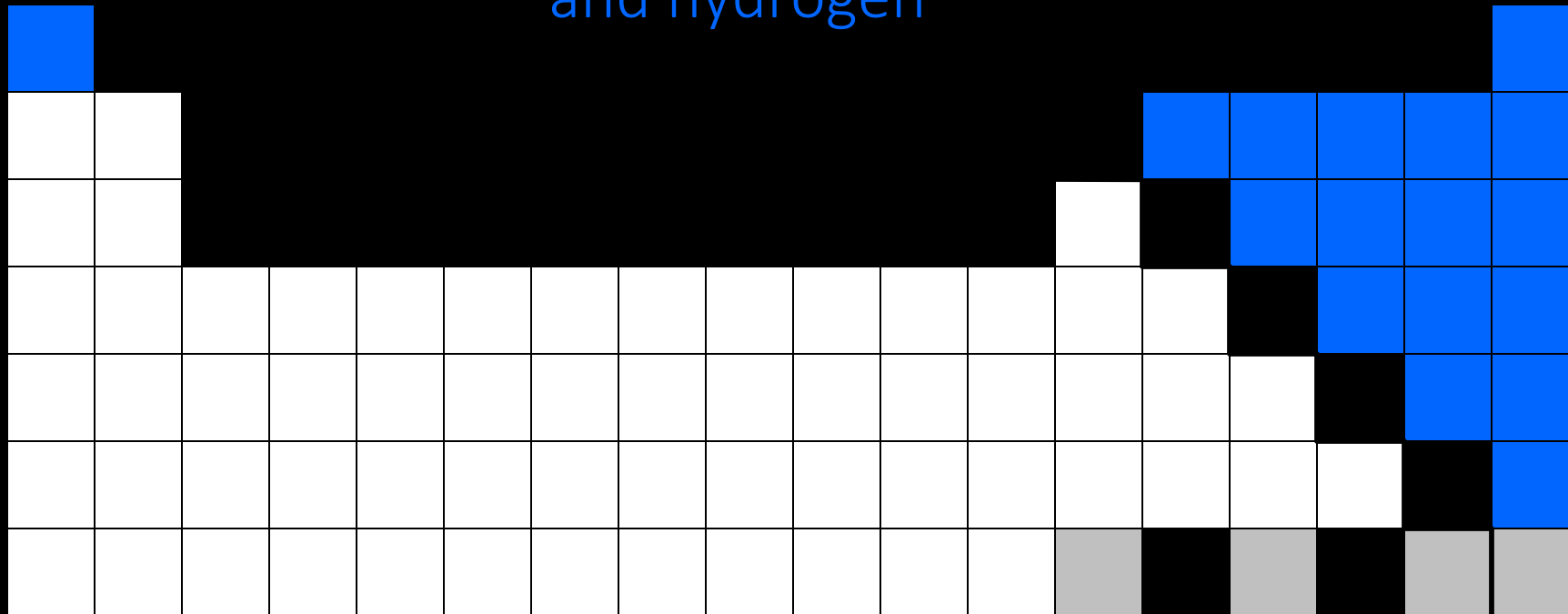


# Properties of Metals

- Lustrous
- Conduct electricity
- Ductile (can be drawn into wires)
- Malleable (can be pounded into sheets)
- High boiling/melting points
- Usually solids

# Nonmetals

- elements to the right of the staircase  
and hydrogen



# Properties of Nonmetals

- Dull appearance
- Non or poor conductors of electricity
- Usually gases or liquids
- Not malleable or ductile



# Properties of Metalloids

Properties are more variable.

Properties are intermediate between those of metals and those of nonmetals.

Know the names of the following regions on the periodic table



# Alkali Metals

Alkaline Earth Metals

A partial periodic table grid is shown. The first column (Group 1) is colored red and contains six cells. The second column (Group 2) is colored yellow and also contains six cells. The rest of the grid is white, with some cells in the bottom row shaded gray. The grid is 6 rows high and 16 columns wide. The first two columns are colored, and the remaining 14 columns are white. The bottom row has four gray cells in the 12th, 13th, 14th, and 15th columns.

A 2x14 grid of white cells, representing a portion of the periodic table.

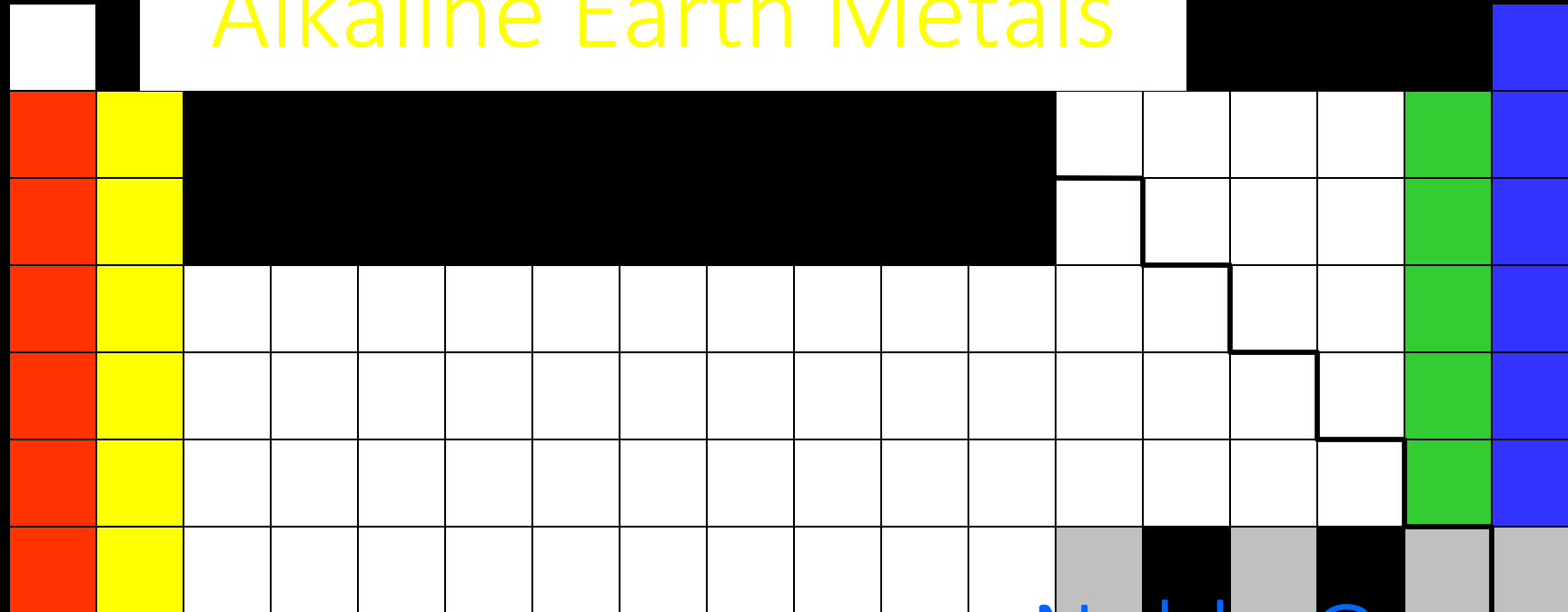




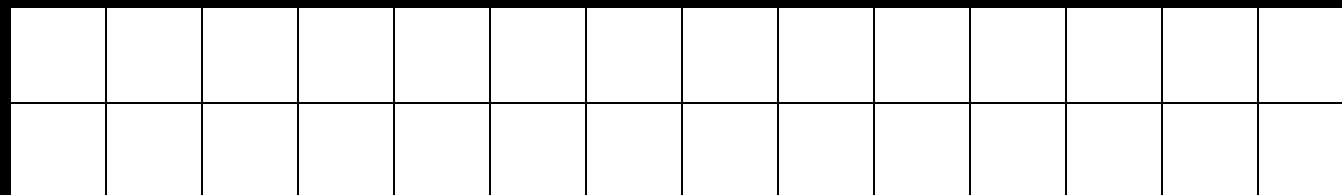
Alkali Metals

Halogens

Alkaline Earth Metals



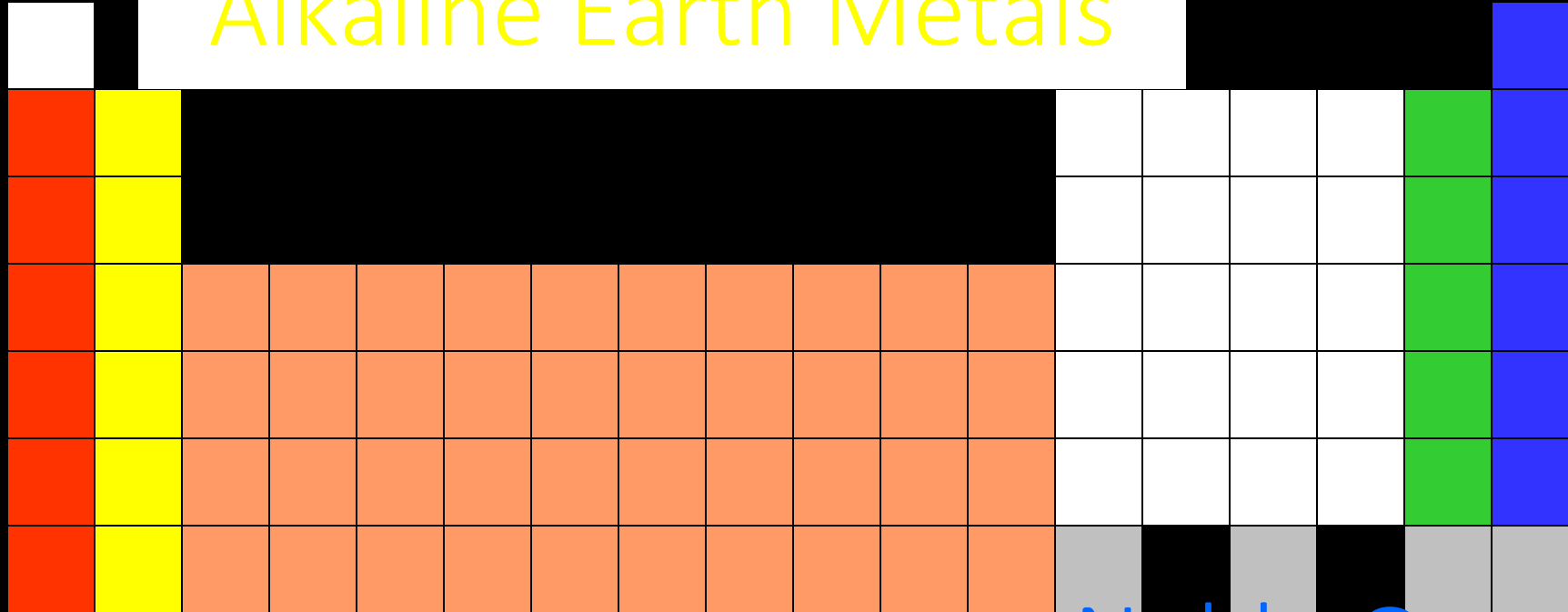
Noble Gases



Alkali Metals

Halogens

Alkaline Earth Metals



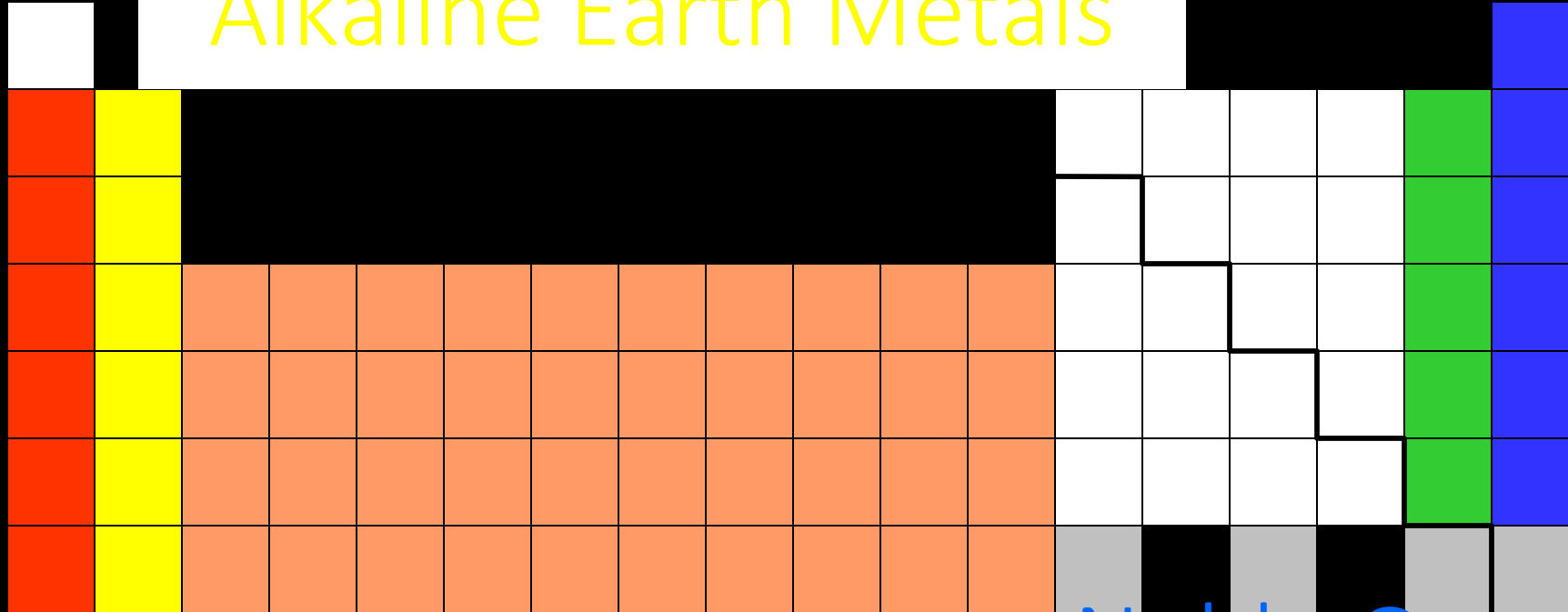
Transition Metals

Noble Gases

Alkali Metals

Halogens

Alkaline Earth Metals



Transition Metals

Noble Gases

Inner Transition Metals

Please note: The inner transition metals ARE part of the periodic table.

To see where they fit in, look at the atomic numbers.

To see an “intact” periodic table, go to

Then click on the box beside “Wide”

The screenshot shows the Ptable website interface. At the top, there are navigation tabs: Wikipedia, Properties, Orbitals, Isotopes, and Compounds. To the right, there are checkboxes for Weight, Names, Electron, and Wide. The 'Wide' checkbox is circled in red. Below the navigation is a 'View PDF' section with instructions and a 'Download' button. The main content is a periodic table with elements color-coded by groups. The inner transition metals (Lanthanoids and Actinoids) are shown as separate rows at the bottom of the table. A small note at the bottom of the table reads: 'For elements with no stable isotopes, the mass number of the isotope with the longest half-life is in parentheses.'

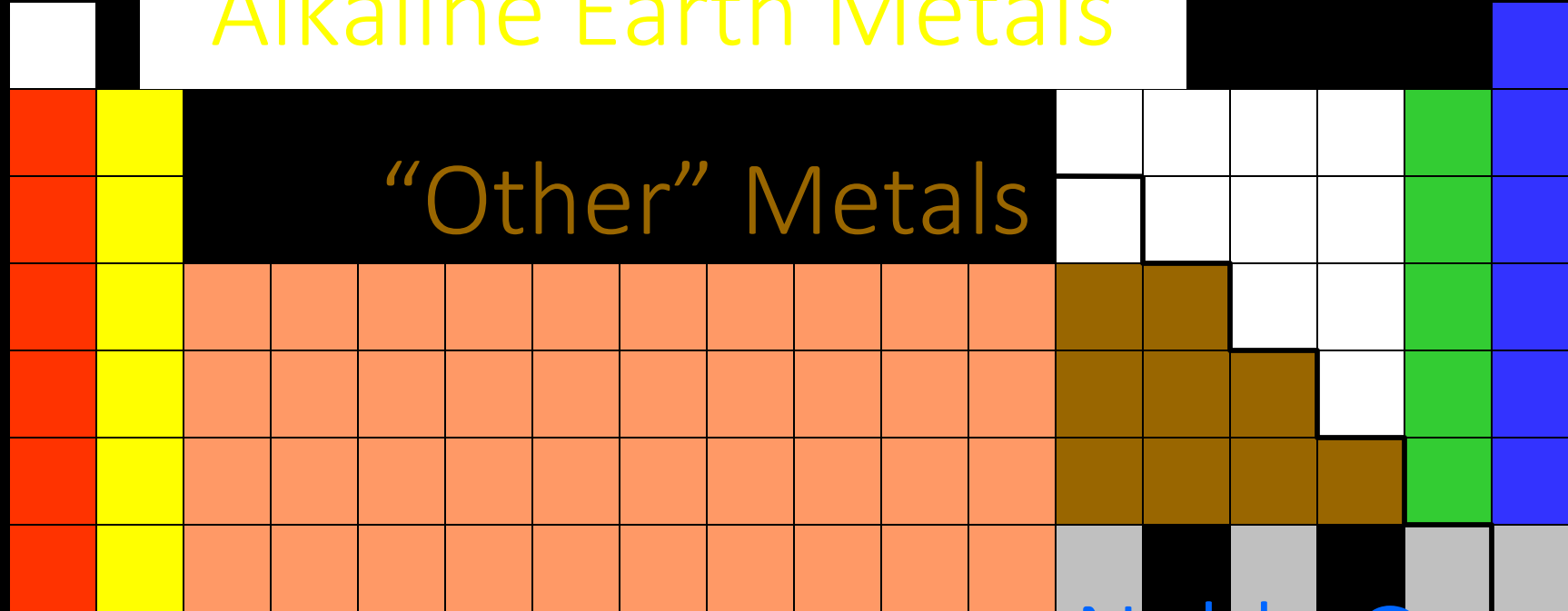
One reason the periodic table is drawn with the inner transition metals separate is so the table fits better onto a single piece of paper.

Alkali Metals

Halogens

Alkaline Earth Metals

“Other” Metals



Transition Metals

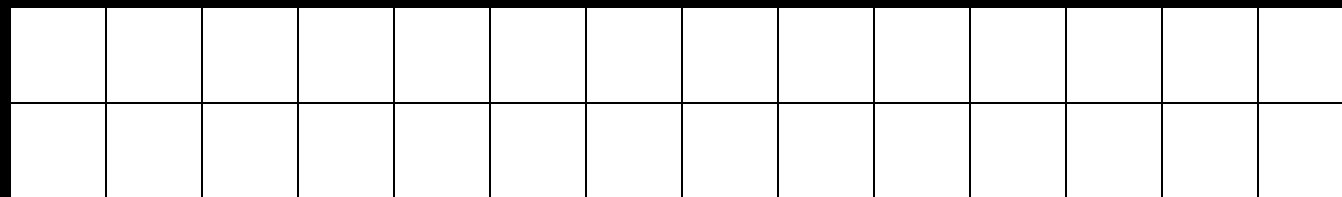
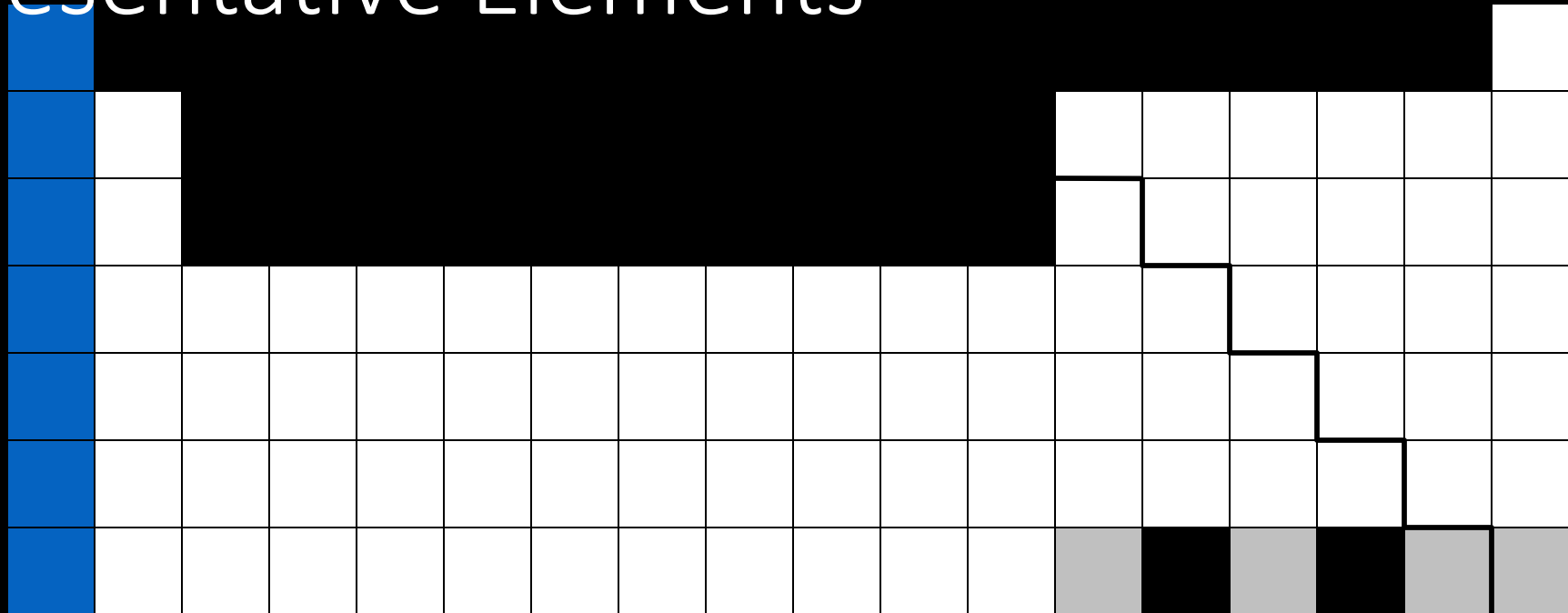
Noble Gases

Inner Transition Metals

# Some Elements are referred to as “Representative Elements”

- Most of the A-Group Elements
- Their properties very clearly illustrate the periodic law

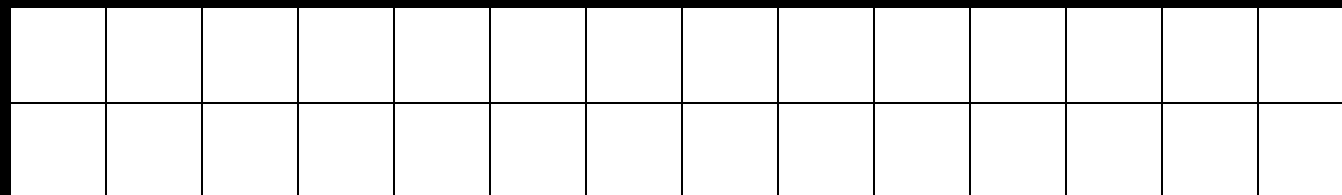
# Representative Elements



All of Column 1.



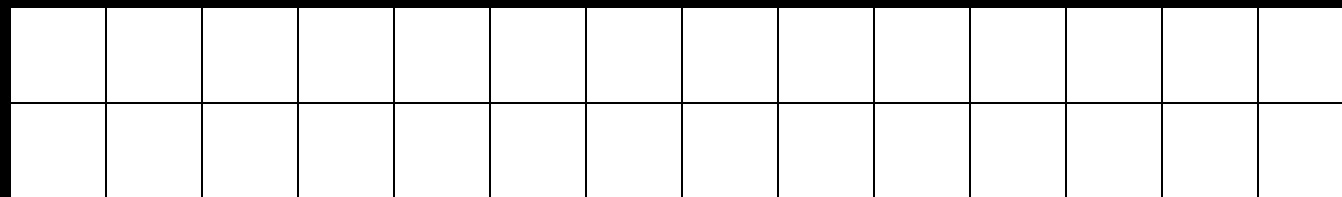
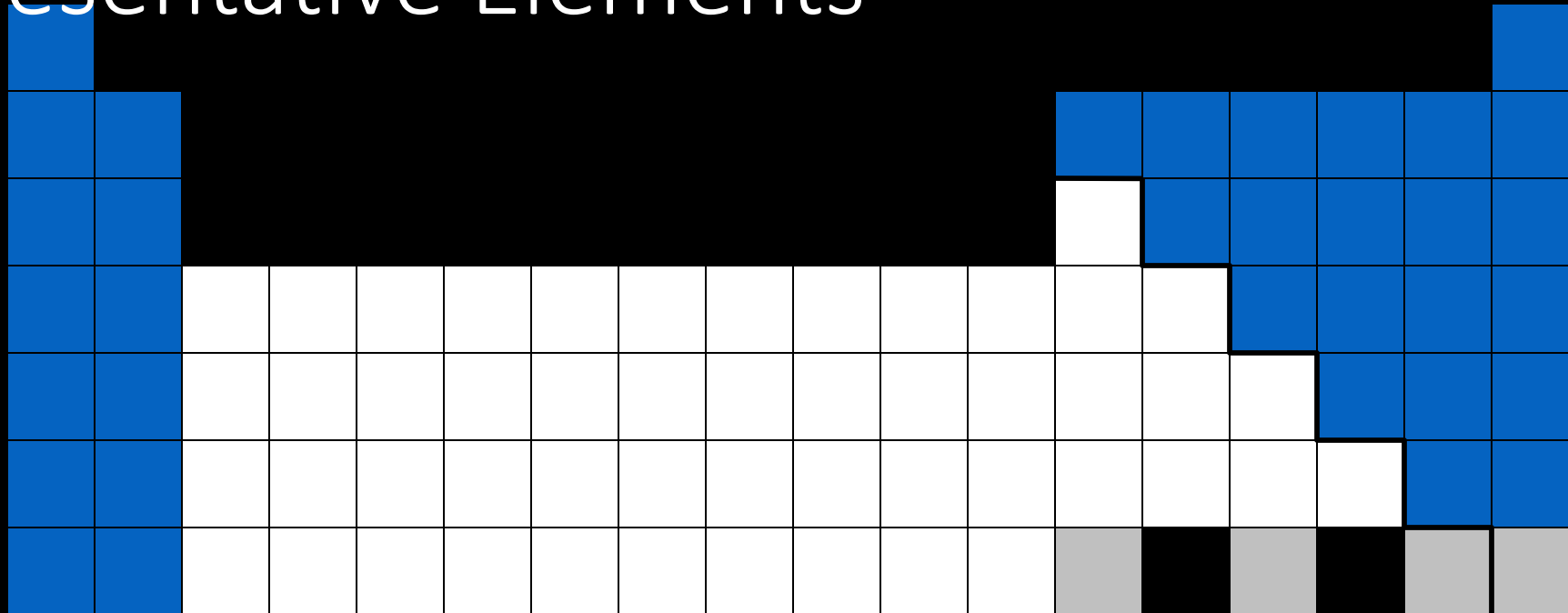
# Representative Elements



All of Column 1.

All of Column 2.

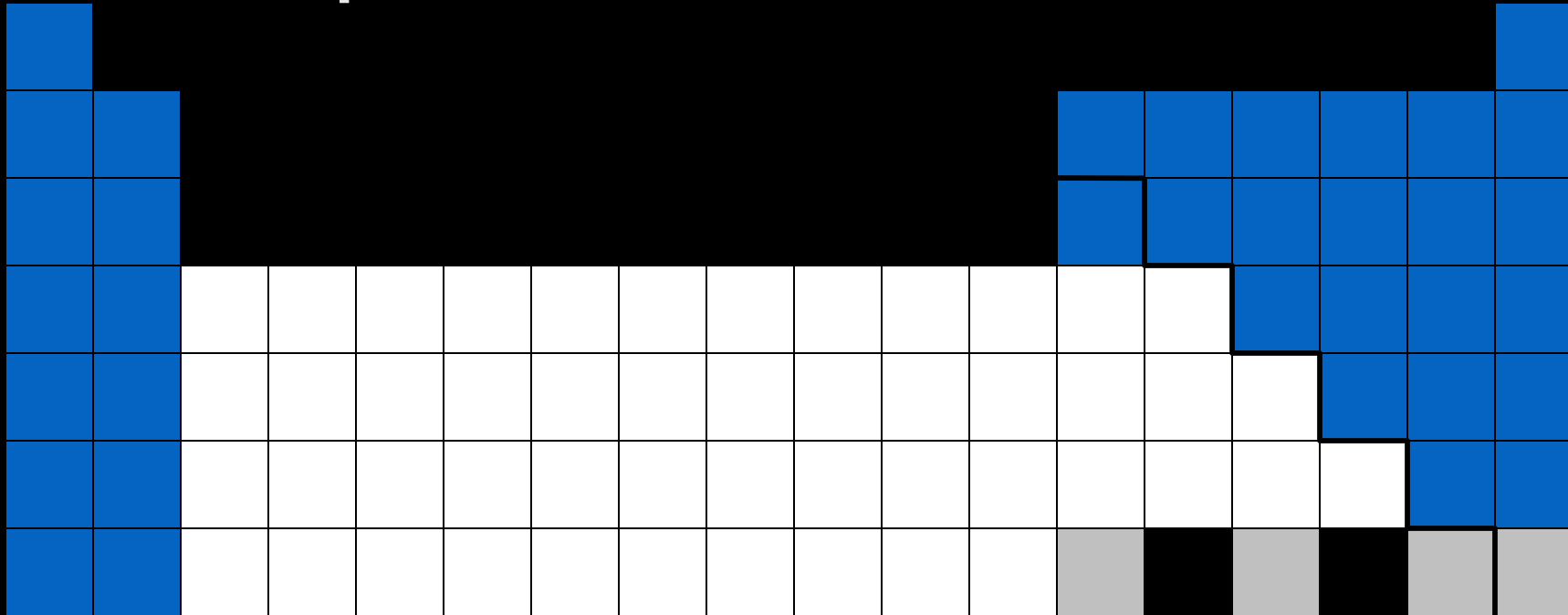
# Representative Elements



All of Column 1.  
All of Column 2.

All the nonmetals.

# Representative Elements



All of Column 1.  
All of Column 2.

All the nonmetals.  
And Aluminum.

# Properties of Metals and Nonmetals

Metals	Nonmetals
Bright metallic luster	Non-lustrous, various colors
Solids are easily deformed (ductile & malleable)	Solids may be hard or soft, usually brittle
Good conductors of heat & electricity	Poor conductors of heat and electricity
Loosely held valence electrons	Tightly held valence electrons
Form positive ions	Form negative ions
Like to lose electrons	Like to gain electrons

# Why the name?

Properties of elements change as you move across a period. The same pattern of properties repeats when you move from one period to the next.

So the properties occur “periodically”.

Elements with similar physical and chemical characteristics end up in same family.

Ex: Group 1A elements are all very reactive with water.