

# PERIODIC TABLE

# PERIODIC TABLE

- A **visual representation** used in Science to organize the elements according to their **chemical and physical properties**
- When talking about the Periodic Table, you will hear words like:
  - Group
  - Family
  - Period
  - Valence electrons
  - Energy levels

# PERIODIC TABLE

- **Group or Family**

- All the elements in a single column on the periodic table are said to be in the same group or family.
- All elements in the same group/family have similar chemical characteristics
  - This is because they have the same number of valence electrons

Valence electrons: the number of electrons in the outer most orbit of an element

# PERIODIC TABLE

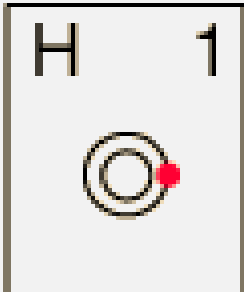



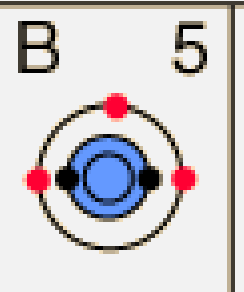

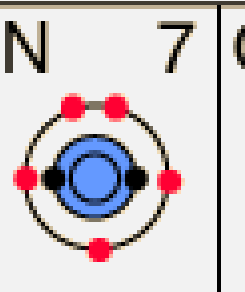
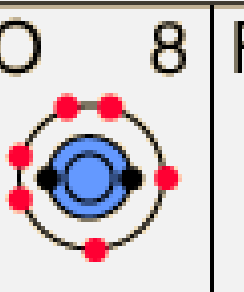






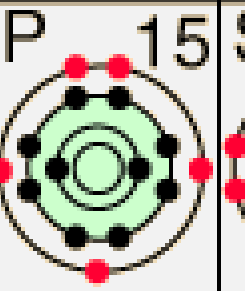
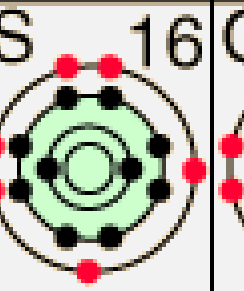


- **Group or Family**

- You will see that on the Periodic Table they are numbered (IA, IIA, IIB, etc)
- Each group/family also has a name (we'll come back to this in a bit)

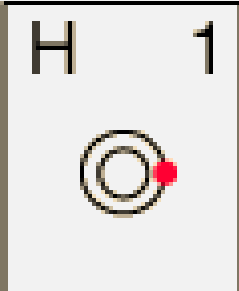
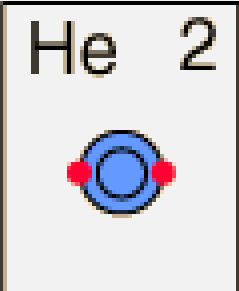
# PERIODIC TABLE

- **Period (orbits, energy levels, energy shells)**
  - All the elements in a single row on the periodic table are said to be in the same period
  - All elements in the same period have the same number of electron shells (orbits)

# Groups (same number of valence electrons)

	1A	2A	3A	4A	5A	6A	7A	8A
n	H 1							He 2
1								
2								
3								

Periods

	1A	2A	3A	4A	5A	6A	7A	8A
n	H 1							He 2
1								
2	Li 3	Be 4	B 5	C 6	N 7	O 8	F 9	Ne 10
3	Na 11	Mg 12	Al 13	Si 14	P 15	S 16	Cl 17	Ar 18

(same number of shells)

# PERIODIC TABLE

- **Staircase**

- You'll also notice that there is a staircase along part of the Periodic Table
- This staircase divides the metals from the non-metals
- Most elements along the staircase are metalloids



# Non-metals

# Metalloids

# Metals

The main periodic table is color-coded to show the distribution of elements. Non-metals are highlighted in yellow, metalloids in purple, and metals in green. The table includes element symbols, names, and atomic weights. The noble gases (He, Ne, Ar, Kr, Xe, Rn) are in yellow. The elements along the diagonal from Boron to Astatine are in purple. All other elements are in green.

1											18							
1	2											13	14	15	16	17	18	
1	3	4											5	6	7	8	9	10
2	3	4											5	6	7	8	9	10
3	11	12											13	14	15	16	17	18
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
6	55	56	57-71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
7	87	88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118

The lanthanide and actinide series are shown below the main table. An arrow points from the space between the 6th and 7th periods of the main table to the lanthanide series. The actinide series is shown below the lanthanide series.

6	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
	lanthanum	cerium	praseodymium	neodymium	promethium	samarium	europium	gadolinium	terbium	dysprosium	holmium	erbium	thulium	ytterbium	lutetium
	138.91	140.12	140.91	144.24	(145)	150.36	151.96	157.25	158.93	162.50	164.93	167.26	168.93	173.04	174.97
7	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
	actinium	thorium	protactinium	uranium	neptunium	plutonium	americium	curium	berkelium	californium	einsteinium	fermium	mendeleevium	nobelium	lawrencium
	(227)	232.04	231.04	238.03	(237)	(244)	(243)	(247)	(247)	(261)	(252)	(257)	(258)	(259)	(262)

# A NOTE ON HYDROGEN

## Hydrogen

You'll notice that hydrogen is labelled as a non-metal even though it is placed on the side with the metals; this is because it does not exhibit most of the characteristics required to be a metal (we'll discuss these shortly)

But sometimes it does act like a metal...

**For our purposes, it is a non-metal!**



# PROPERTIES OF METALS, NON-METALS AND METALLOIDS

- **Metals:**
  - Left of the staircase
  - Metallic lustre
  - Good heat conductors
  - Good electrical conductors
  - Malleable
  - Ductile
  - Very reactive when placed in water and acid
  - High melting point
  - All solid at room temperature (except mercury)



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# Potassium in Water

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**REACTION ONLY**

THE PERIODIC TABLE OF VIDEOS

By Brady Haran



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# PROPERTIES OF METALS, NON-METALS AND METALLOIDS

- **Non-Metals:**
  - **Right of the staircase**
  - **Opposite properties of metals:**
    - **No metallic lustre**
    - **Do not conduct heat or electricity well**
    - **Not malleable**
    - **Not ductile**
    - **Do not react violently with acids or water**
  - **Can be solid, liquid or gas at room temperature**

# PROPERTIES OF METALS, NON-METALS AND METALLOIDS

- **Metalloids:**
  - Along the staircase
  - Exhibit some characteristics of metals AND some of non-metals
    - Ex: shiny (like a metal) but not malleable (like a non-metal)

# GROUP NAMES & CHARACTERISTICS

		Number of e- in Outer Shell (Group)																			
		I A	II A											III A	IV A	V A	VI A	VII A	VIII A		
Shell Number (Period)	1																				
	2																				
	3					III B	IV B	V B	VI B	VII B	VIII B	I B	II B								
	4	Alkali Metals	Alkali Earth Metals	Transition Metals																	
	5																				
	6																				
	7																				
		Rare Earth Elements																			

# GROUP NAMES & CHARACTERISTICS

- **Alkali metals**
  - **First group** on the left (does not include **hydrogen** ← remember, not a metal)
  - The **most reactive family**
    - Because each element only has **one valence electron**
  - Obviously, have all the properties of metals



# GROUP NAMES & CHARACTERISTICS

- **Alkaline earth metals**
  - Second group from the left (starts with Beryllium)
  - Very reactive but not as much as alkali metals
  - Again, have all the properties of metals

# GROUP NAMES & CHARACTERISTICS

- **Transition metals**
  - All the metals in the **middle** chunk of the Periodic Table
    - You're not responsible for them! 😊



# GROUP NAMES & CHARACTERISTICS

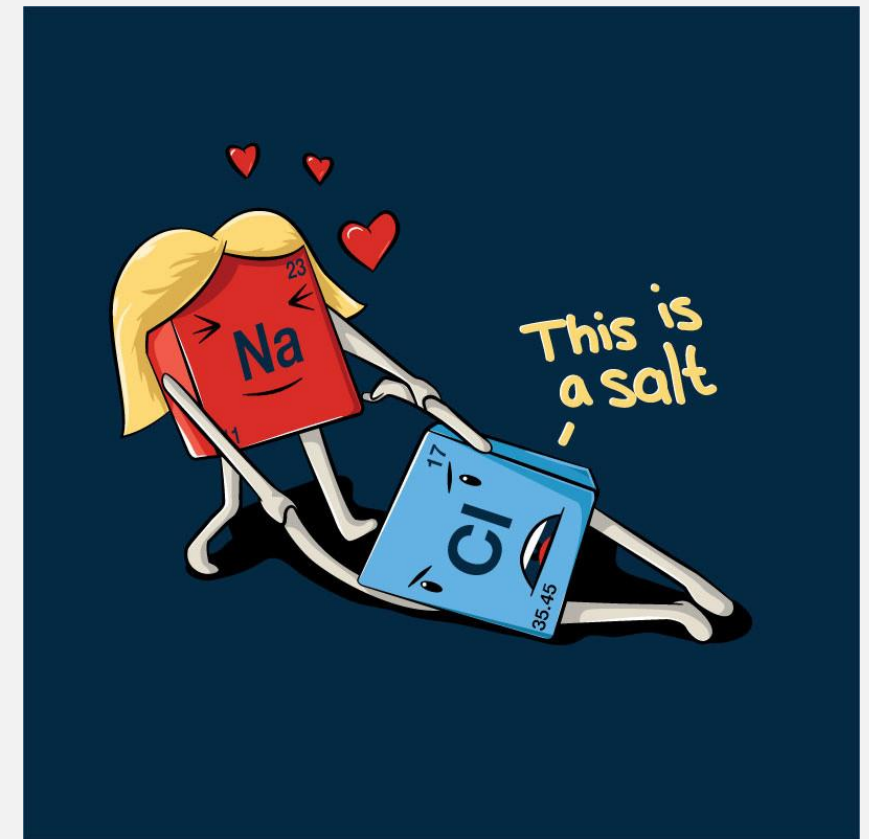
- **Groups 3A, 4A, 5A and 6A**
  - Just named after the first element in the group
    - Ex: Boron family, Carbon family, etc

**FYI: They don't usually ask you about these on the exam**

# GROUP NAMES & CHARACTERISTICS

- **Halogens**
  - **Group 7A** (begins with Fluorine)
  - Have all the characteristics of **non-metals**
  - If you **mix a halogen with a metal**, you'll get a **salt**
    - Halogen + metal = salt
  - Used as **disinfectants/antiseptics**
    - Kills bacteria, fungi, etc

That's why people use chlorine to keep their pools from growing algae!



# GROUP NAMES & CHARACTERISTICS

- **Noble or Inert Gases**
  - Produce a **bright light** when **electricity** is passed through them
    - Think neon signs
  - **All of their electron shells are full**
    - This means that these elements are **fully stable** → they **do not react chemically** with any other substance
      - Will **NOT** form compounds



**PRACTICE**

# PRACTICE QUESTIONS

- 1) Fill in the table below.

Element	Number of valence electrons	Chemical family name
Br	7 ve-	Halogen
Ca	2 ve-	Alkaline earth metal
Na	1 ve-	Alkali metal
He	2 ve-	Inert gas

# PRACTICE QUESTIONS

- 2) Four elements from the periodic table are described below:

**Be** • Element 1: This element from Period 2 has two more electrons than helium

**Na** • Element 2: This soft metal from Period 3 has one valence electron.

**Ca** • Element 3: This element from Period 4 is found in bones and teeth

**Si** • Element 4: This element from Period 3 has some of the properties of metals and non-metals

- Which of these elements belong to the same group or chemical family?

A) 1 and 2

C) 2 and 4

B) 1 and 3

D) 3 and 4