THE PERIODIC TABLE

BUCKET BUDDIES

Exploring how elements are arranged throughout the Periodic Table with:

1 H							
3 Li	4 Be						
11 Na	12 Mg						
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru
55 Cs	56 Ba	57-71	72 Hf	73 Ta	74 W	75 Re	76 Os
87 Fr	88 Ra	89-103	104 Rf	105 Db	106 Sg	107 Bh	108 Hs

57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm

Lesson Outline

- Features of the periodic table
- Electronic structure of an atom
- Properties of metals, non-metals and metalloids
- Periodic trends in reactivity

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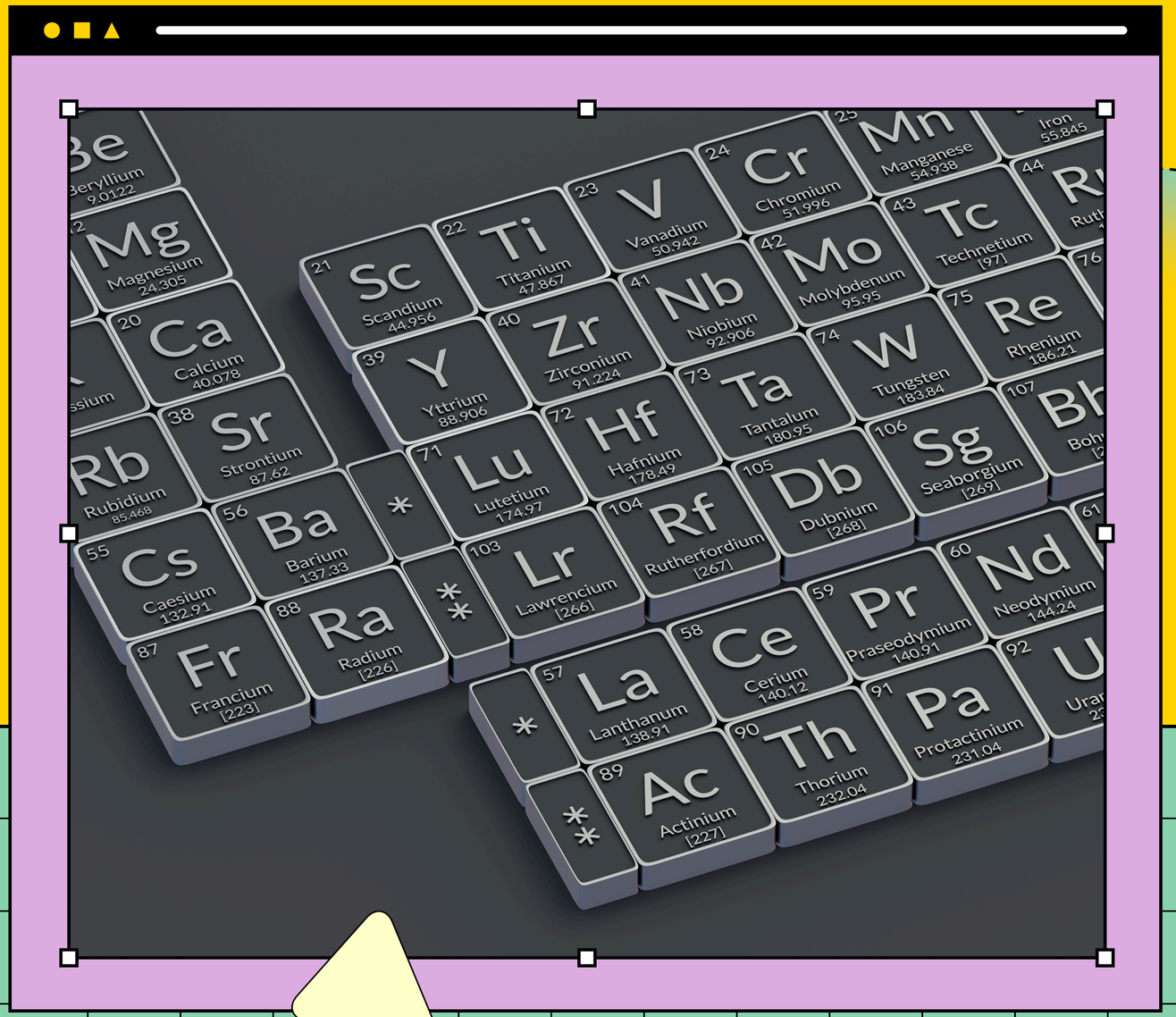
How are elements arranged in the periodic table?



Learning Outcomes

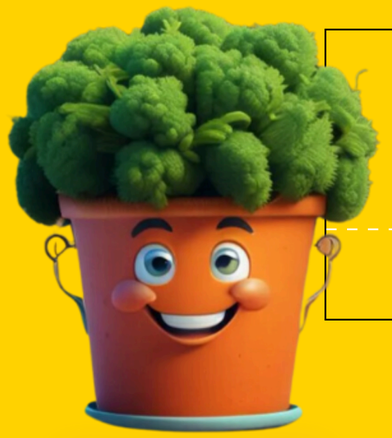
- Explain the features of the periodic table of elements
- Draw the electronic structure of elements with the help of the periodic table
- Describe the characteristics of metals, non-metals, and metalloids
- Recognise and predict properties based on trends in the periodic table

Periodic Table of Elements

It contains the atomic mass, atomic number and chemical symbol associated with a known element. As of today, there are 118 elements in the periodic table.

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	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57-71	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Ti	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89-103	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og

57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr



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Features of the Periodic Table

A **row is called a period**; each element's atomic number increases as you move along the periods.

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	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
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89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Features of the Periodic Table

A **column is called a group**; elements in the same group all have the same number of valence electrons in their outer shells.

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	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
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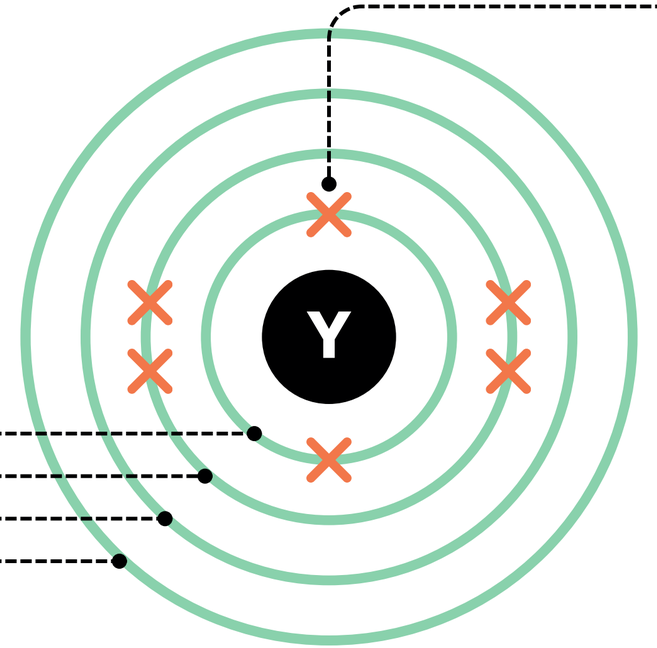
Now, we'll study the structure of the atom 'beyond' what we can see in the periodic table.

We will look at the element's **electronic structure**.

Electronic Structure

Illustrates the electron arrangement of an atom of an element



Electrons can be shown as a cross or a dot.

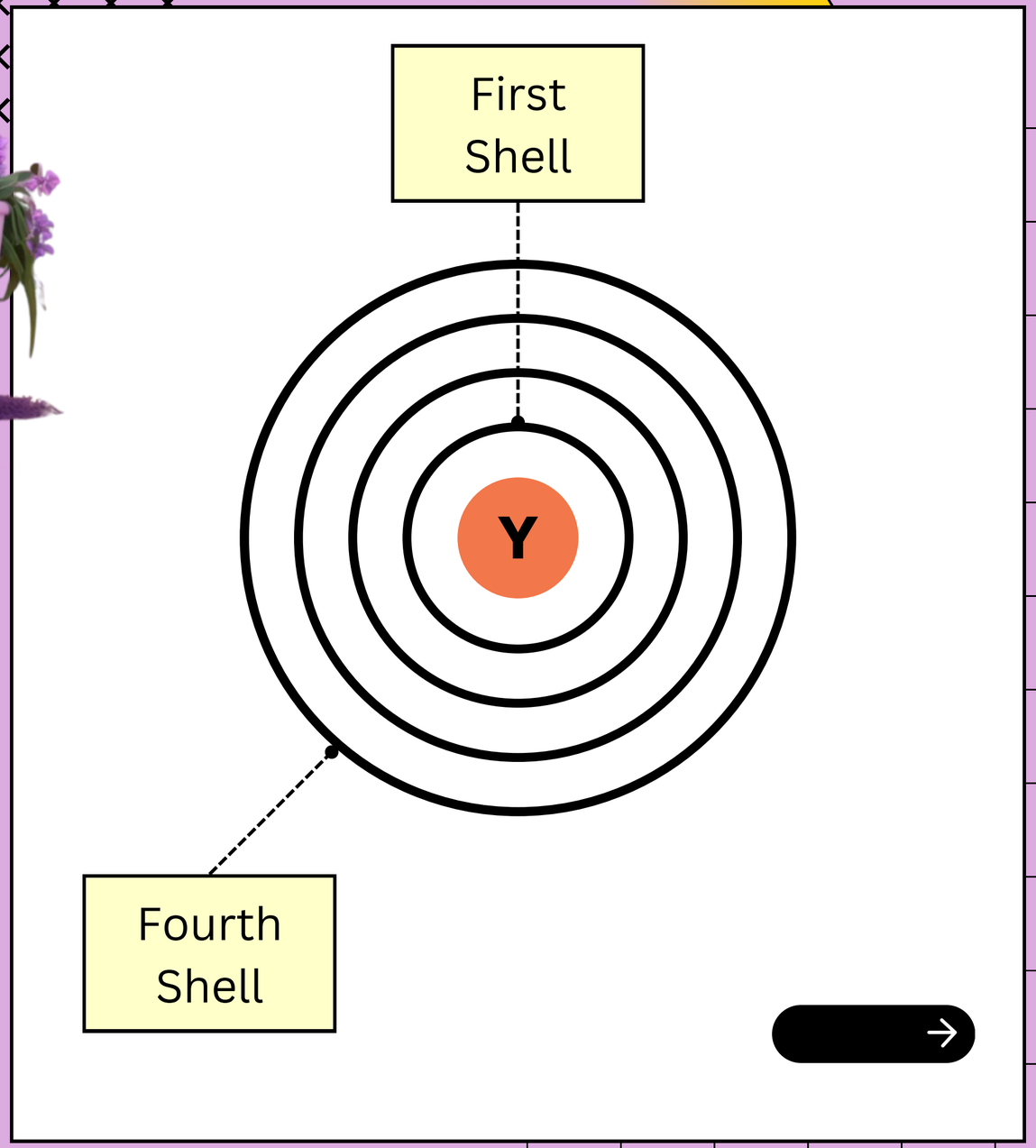
Electrons occupy energy levels, also known as **electron shells**.

RULES

Electronic Structure

Follow the rules below when drawing the electronic structure of an element:

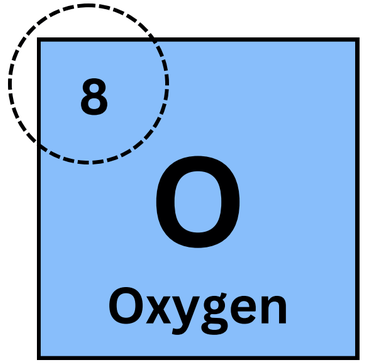
- **2** electrons in the first shell
- **8** electrons in the second shell
- **18** electrons in the third shell
- **32** electrons in the fourth shell



EXAMPLE:

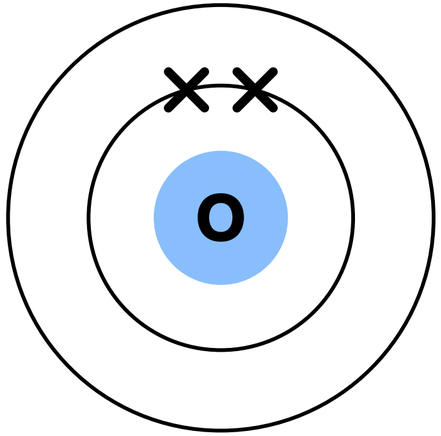
Oxygen

Atomic number = 8



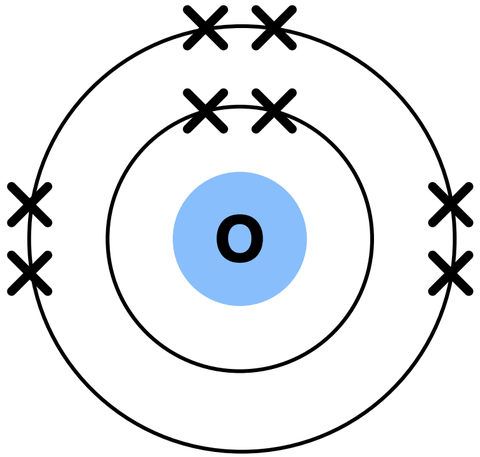
1st Shell

Always start with the first shell and work your way outwards. Note that only 2 electrons can be on the 1st shell.



Step 2: 2nd Shell

Oxygen still has 6 more electrons, we can place that on the 2nd shell since it can have 8 electrons in total.



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Electronic Configuration

Identifies how many electrons are in a shell. Follow this format in writing electronic configuration:

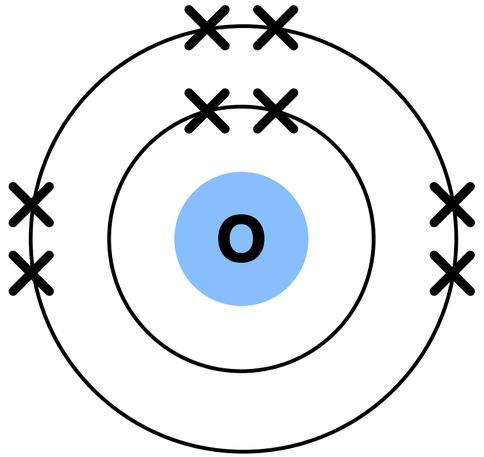
[1st shell electrons].[2nd shell electrons].[3rd shell electrons] and so on...

Each dot or comma separates one shell from the next.

EXAMPLE:

Oxygen

By following the format, oxygen's electronic configuration i 2.6



Learning Check!

Draw the **electronic structure** for lithium, sodium and potassium and write the **electronic configuration** for each element.

What trend do you notice regarding the atomic number and the electron in the outermost shell?

3	11	19
Li	N	K
Lithium	Sodium	Potassium

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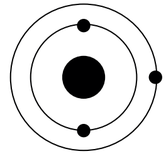
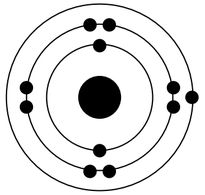
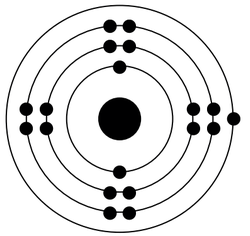
Learning Check!

- The atomic number **increases down the group**.
- The atomic number tells you **how many electrons** each element has.
- Each group 1 element structure has **1 electron in its outer shell**.
- Elements are **grouped** together **by the number of electrons** that they have in their **outer shells**.

ANSWER KEY

Atomic Number	Name	Electronic Configuration	Diagram of an Atom
3	Lithium	2.1	
11	Sodium	2.8.1	
19	Potassium	2.8.8.1	

Properties of Metals and Non-Metals

Metals
Shiny
Good conductors of heat/electricity
Malleable
High density
High melting points

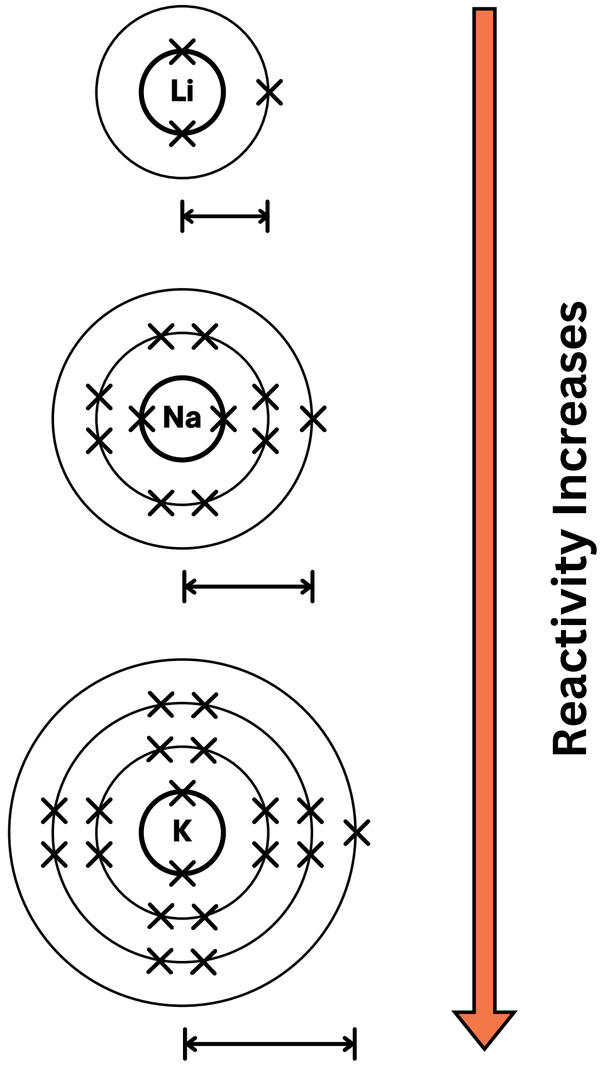
Non-Metals
Dull
Poor conductors of heat/electricity
Brittle
Low density
Low melting points

Trends in a Metal Group

Reactivity increases down group 1 Alkali Metals.

As the **atomic radius increases**, the electrostatic force of attraction becomes weaker between the positively charged nucleus and the outer most (valence) electron.

This increases the reactivity down the group.

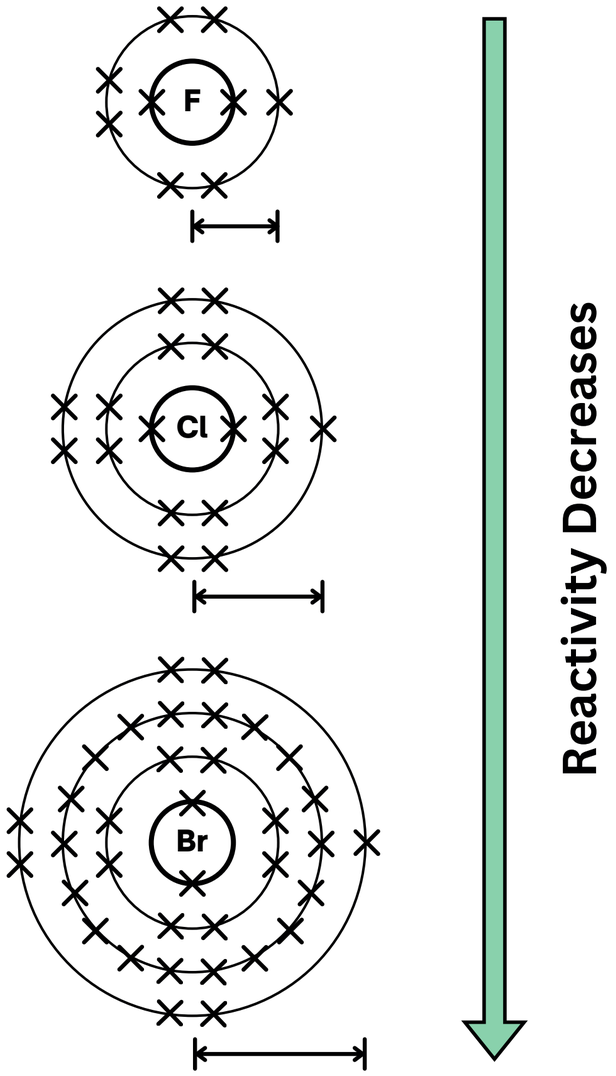


Trends in a Non-Metal Group

Reactivity decreases down group 7 Halogens.

Fluorine is the most reactive in this group because its outer (valance) electrons are close to the atomic radius of the positively charged nucleus, making it easier for an additional electron to be attracted to fluorine.

Down the group, the **atomic radius gets larger and the electrostatic attraction becomes weaker**, making it harder for group 7 elements to attract one additional electron.



Learning Check!

Complete the table below.

Properties	Metals	Non-Metals
Appearance		
Conduction of Heat and Electricity		
Malleability		
Density		
Melting Point		
Trend in Reactivity		

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Learning Check!

ANSWER KEY

Complete the table below.

Properties	Metals	Non-Metals
Appearance	Shiny	Dull
Conduction of Heat and Electricity	Good conductors	Poor conductor
Malleability	Malleable	Brittle
Density	High density	Low density
Melting Point	High melting points	Low melting points
Trend in Reactivity	Increases downward	Decreases downward

Summary

- The **modern periodic table** organises elements by atomic number, revealing their structural arrangement.
- Elements' positions in the periodic table reflect their atomic structure and outer electron arrangement.
- Similar properties among elements within a group on the periodic table can be explained through identifiable trends.
- Metals and non-metals exhibit characteristic properties that can be identified through their placement on the periodic table.