

The Periodic Table of the Chemical Elements

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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	57-103 La-Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg							81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	

TOPIC 8: PERIODIC TABLE

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	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po

THE ABOUT

CHAPTER ANALYSIS



TIME

- Content heavy chapter
- 3 **key** concepts



EXAM

- Usually tested along with 'Atomic Structure' & 'Chemical Bonding'
- Highly tested on specifically 'alkali metals', 'halogens' & 'noble gases'.



WEIGHTAGE

- Medium overall weightage
- Constitute to **4%** of marks for past 5 year papers

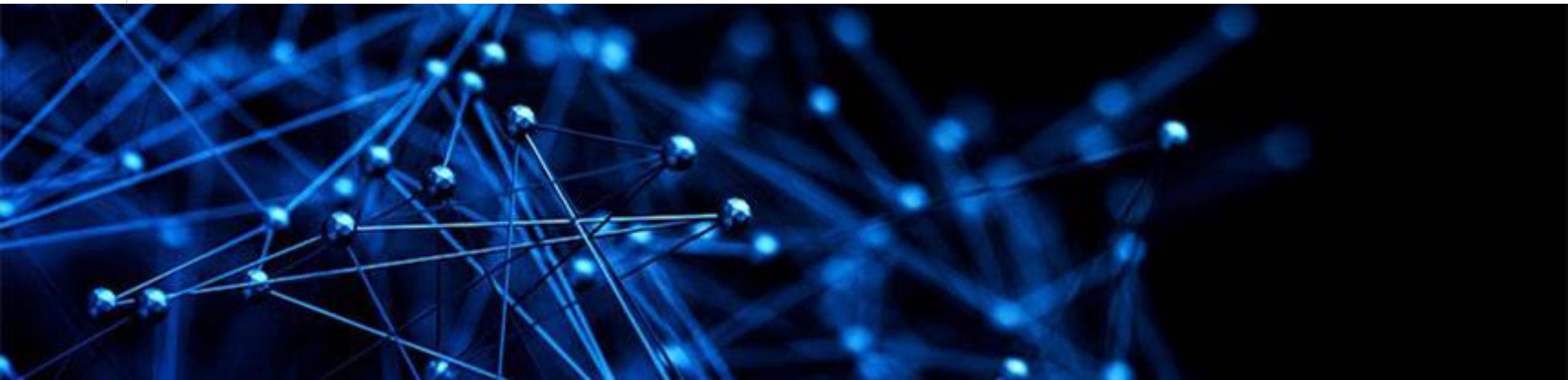
KEY CONCEPT

PERIODIC TABLE & TRANSITION METALS

ALKALI METALS

HALOGENS

NOBLE GASES



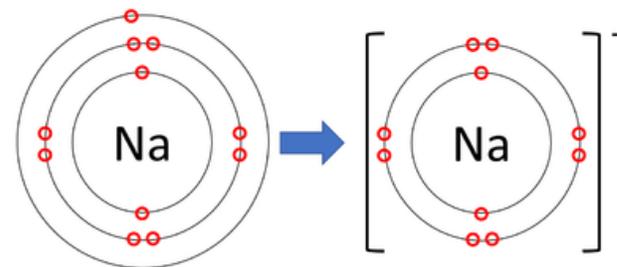
PERIODIC TABLE

Group	I	II	III	IV	V	VI	VII	VIII
Valence electrons	1	2	3	4	5	6	7	8
Period II	Li	Be	B	C	N	O	F	Ne
Ion	Li ⁺	Be ²⁺	B ³⁺	-	N ³⁻	O ²⁻	F ⁻	-
Period III	Na	Mg	Al	Si	P	S	Cl	Ar
Ion	Na ⁺	Mg ²⁺	Al ³⁺	-	P ³⁻	S ²⁻	Cl ⁻	-

ION FORMATION

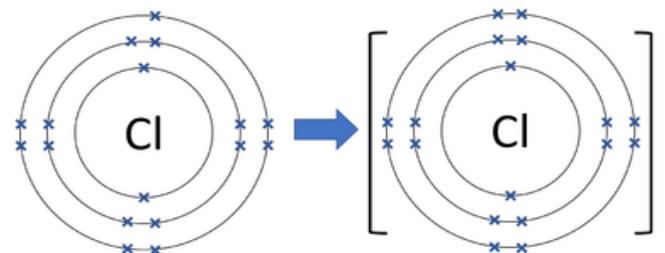
Metallic elements will form **cations** as they **lose their valence electrons** to form **positively charged ions**.

For example, Group I elements like Sodium (Na) will form Na⁺ with charge +1.



Non-metallic elements will **form anions** as they **gain electrons** to form **negatively charged ions**.

For example, Group VII elements like chlorine (Cl) will form Cl⁻ with charge of -1.



TRANSITION METALS

Transition Metals

1	2	13	14	15	16	17	18
1 H Hydrogen	2 He Helium	3 B Boron	4 C Carbon	5 N Nitrogen	6 O Oxygen	7 F Fluorine	8 Ne Neon
3 Li Lithium	4 Be Beryllium	9 Al Aluminium	10 Si Silicon	11 P Phosphorus	12 S Sulphur	13 Cl Chlorine	14 Ar Argon
5 Na Sodium	6 Mg Magnesium	15 Ga Gallium	16 Ge Germanium	17 As Arsenic	18 Se Selenium	19 Br Bromine	18 Kr Krypton
7 K Potassium	8 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron
9 Rb Rubidium	10 Sr Strontium	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium
11 Cs Caesium	12 Ba Barium	33 In Indium	34 Sn Tin	35 Sb Antimony	36 Te Tellurium	37 I Iodine	36 Kr Krypton
13 Fr Francium	14 Ra Radium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium
15 Ac Actinium	16 Th Thorium	53 Bi Bismuth	54 Po Polonium	55 At Astatine	56 Rn Radon	57 La Lanthanum	58 Ce Cerium
17 Fr Francium	18 Ra Radium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium
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29 Ac Actinium	30 Th Thorium	95 Eu Europium	96 Gd Gadolinium	97 Tb Terbium	98 Dy Dysprosium	99 Ho Holmium	100 Er Erbium
31 Ac Actinium	32 Th Thorium	101 Lu Lutetium	102 Hf Hafnium	103 Ta Tantalum	104 W Tungsten	105 Re Rhenium	106 Os Osmium
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231 Ac Actinium	232 Th Thorium	701					

ALKALI METALS

Name of element	Melting points / °C	Density / gcm ⁻³
Lithium (Li)	180	0.534
Sodium (Na)	98	0.971
Potassium (K)	63	0.862
Rubidium (Rb)	39	1.532
Caesium (Cs)	28	1.873
Francium (Fr)	27	-
	(decreases down the group)	(increases down the group)

GROUP I: ALKALI METALS

Group I elements are called alkali metals as they react with water to give alkaline solutions.

Metal	Chloride	Nitrate	Carbonate	Sulfate	Oxide	Hydroxide
Lithium	LiCl	LiNO ₃	Li ₂ CO ₃	Li ₂ SO ₄	Li ₂ O	LiOH
Sodium	NaCl	NaNO ₃	Na ₂ CO ₃	Na ₂ SO ₄	Na ₂ O	NaOH
Potassium	KCl	KNO ₃	K ₂ CO ₃	K ₂ SO ₄	K ₂ O	KOH

PHYSICAL PROPERTIES OF ALKALI METALS

- **Low melting points**
- **Low densities**, lithium, sodium and potassium can float on water
- Good conductor of electricity & heat

Densities of alkali metals generally increase down the group while melting points decrease down the group.

This is due to the increase in atomic radius down the group.

Chemical properties of alkali metals

As they have only one valence electron in their outermost shell, they form ionic compounds, with their resulting ions of +1 charge.

Reactivity of alkali metals increases down the group due to the extra electron shells and the nucleus is further away, which increases the **ease of losing the valence electron**.

HALOGENS

Name of element	State	Colour
Fluorine (F ₂)	Gas	Pale Yellow
Chlorine (Cl ₂)	Gas	Green Yellow
Bromine (Br ₂)	Liquid	Reddish brown
Iodine (I ₂)	Solid	Black
Astatine (At ₂)	Solid	Black
	(increases down the group)	(increasing colour intensity)

GROUP VII: THE HALOGENS

Halogens usually exist as diatomic molecules.

PHYSICAL PROPERTIES OF HALOGENS

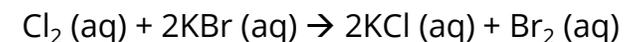
- **Low melting and boiling points that has an increasing trend down the group**
- **Densities of the halogens increase down the group**
- Dissolve sparingly in water (chlorine, bromine and iodine) generally, but soluble in organic solvents.
- Does not conduct electricity due to a lack of mobile charge carriers

CHEMICAL PROPERTIES OF HALOGENS

Reactivity decreases down the group. The **ease of gaining a valence electron decreases** as the valence shell is further away from the nucleus, making it **more difficult to attract an electron.**

DISPLACEMENT REACTION

A **more reactive halogen** is able to **displace a less reactive halogen** from an aqueous solution of its ions.



The solution will turn reddish brown due to the aqueous bromine produced.

NOBLE GAS

Name of element	Melting points / °C	Boiling points / °C	State
Helium (He)	-	-269	Gas
Neon (Ne)	-248	-246	Gas
Argon (Ar)	-189	-186	Gas
Krypton (Kr)	-157	-153	Gas
Xenon (Xe)	-111	-108	Gas
Radon (Rn)	-71	-62	Gas
	(increases down the group)	(increases down the group)	

GROUP 0: THE NOBLE GASES

All noble gases have a **fully filled valence shell**.

Noble gases are **unreactive** and **inert** since they have a **stable electronic configuration**.

They exist as mono-atomic particles (single atoms).

PHYSICAL PROPERTIES OF NOBLE GASES

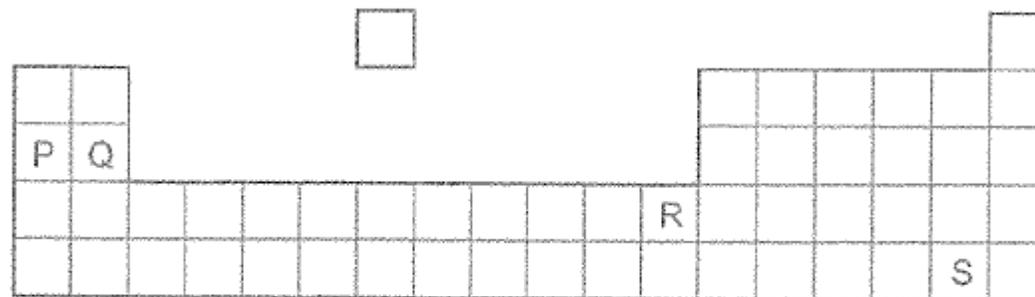
- Do not conduct electricity (lack of charge carriers)
- Very low melting and boiling points
- Increasing melting and boiling points going down the group
- Increasing densities of noble gases going down the group

USE OF NOBLE GASES

Element	Application	Reason
Helium (He)	Fill airships & hot air balloons	Low density comparative to air
Neon (Ne)	Fill interior of neon light tubes	Unreactive gas
Argon (Ar)	Fill light bulbs	Unreactive gas

Try it yourself! (TYS Question)

19. The diagram shows part of the Periodic Table.



Which two elements would react together most vigorously?

(N2020/P1/Q23)

- A P and R
- C Q and S

- B P and S
- D R and S

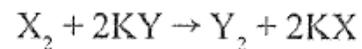
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Answer:

19. **B**
Elements P, Q and R will react with S to form an ionic compound. However, P is the most reactive element and gives the most vigorous reaction.

Try it yourself! (TYS Question)

20. In the equation shown, X and Y represent elements in Group VII of the Periodic Table.



Which pair of elements could be X and Y?

(N2020/P1/Q24)

	X	Y
1	chlorine	iodine
2	bromine	chlorine
3	bromine	iodine
4	iodine	fluorine

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

()

Answer:

20. A

In Group VII, a more reactive element is higher in position in the group. X must be more reactive than Y since a reaction happens between X_2 and KY.

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Notes prepared by:



Darrell Er
'O' Levels Chemistry & Physics



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