The Periodic Table Trends

All physical and chemical behavior of the elements is based ultimately on the electron configurations of their atoms.

A **vertical row** is called a group or a column.

Each group is numbered (starting on the left; Group I) and some have "family names" (e.g. Group 1 are the Alkali Metals, Group 2 are the Alkaline Earths; Group 17 are the Halogens).

A **horizontal row** is called a period or a row.

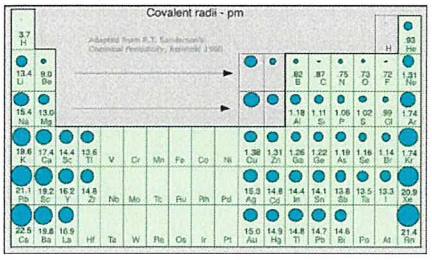
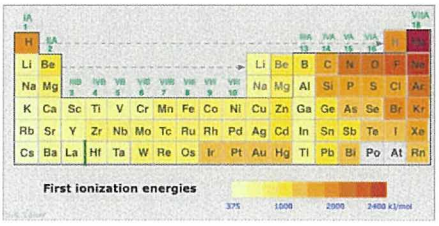
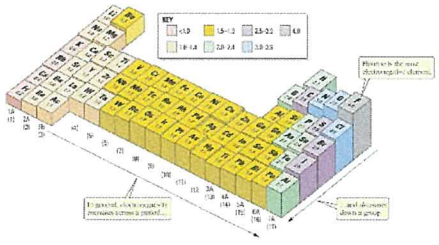
The first row consists of hydrogen and helium; the second row starts with lithium and ends at neon. There are seven rows in the modern form of the Periodic Table.

The elements are arranged in the Periodic Table in order of **increasing atomic number**, and with few exceptions, this also means in order of **increasing relative atomic mass**. The table is called "periodic" because chemical and physical properties repeat periodically, leading to the vertical "family" groupings.

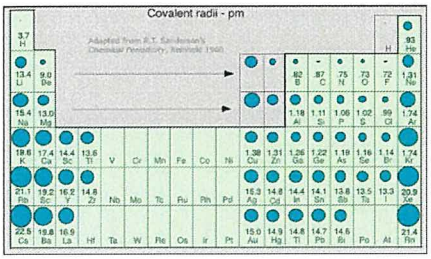
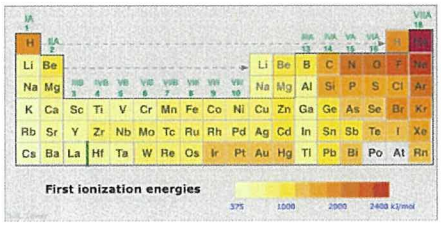
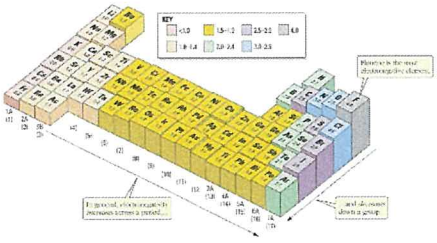
Key terms:

Atomic radius	
Nuclear charge	
Ionisation energy	**First:** **Successive:**
Electronegativity	
Electron affinity	

PERIODIC TABLE TRENDS **ACROSS PERIODS**:

TREND	TRENDS AND EXPLANATIONS
ATOMIC RADIUS 	Trend:
	Explanation:
IONISATION ENERGY 	Trend:
	Explanation:
ELECTRONEGATIVITY 	Trend:
	Explanation:

PERIODIC TABLE TRENDS **DOWN GROUPS**:

TREND	TRENDS AND EXPLANATIONS
ATOMIC RADIUS 	Trend:
	Explanation:
IONISATION ENERGY 	Trend:
	Explanation:
ELECTRONEGATIVITY 	Trend:
	Explanation:

KNOCKHARDY NOTES

A LEVEL CHEMISTRY

PERIODICITY

AT A GLANCE

TRENDS

① ELECTRONIC CONFIGURATION
② ATOMIC RADIUS
③ IONISATION ENERGY
④ ELECTRON AFFINITY
⑤ ELECTRONEGATIVITY
⑥ MELTING POINT

Most trends can be explained by considering the attraction between the protons in the nucleus and the electrons in the outer shell or energy level

DOWN GROUPS

- atomic number increases
- atoms have more protons - increased nuclear charge
- atoms get bigger - electrons occupy more shells
- outer electrons are shielded by filled inner shells
- outer electrons are further from nucleus
- the pulling power of the nucleus gets less
- outer electrons are held less strongly

ACROSS PERIODS

- atomic number increases by one each time
- atoms have one more proton and electron
- slight increase in nuclear charge
- electrons occupy the same shell - no increase in shielding
- outer electrons are no further from nucleus
- the pulling power of the nucleus gets a little greater
- outer electrons are held more strongly

Nuclear Charge	The charge due to the protons in the nucleus
Effective nuclear Charge	The effectiveness of the nuclear charge after passing through any filled inner shells

PERIODIC TRENDS

ALL TRENDS REFER TO GOING DOWN A GROUP AND ACROSS A PERIOD

ATOMIC RADIUS

Groups	INCREASES	• *more electrons going into shells further from nucleus*
Periods	DECREASES	• *increased nuclear charge attracts electrons*

IONISATION ENERGY

Groups	DECREASES	• *electrons further from nucleus* • *more shielding* • *electrons held less strongly - easier to remove*
Periods	INCREASES	• *increased nuclear charge attracts electrons* • *electrons become harder to remove* • *IRREGULARITIES due to the way orbitals are filled*

ELECTRONEGATIVITY

Groups	DECREASES	• *electrons further from nucleus* • *more shielding* • *electron pair in covalent bond is attracted less strongly*
Periods	INCREASES	• *increased nuclear charge attracts electron pair in bond*

ELECTRON AFFINITY

Groups	LESS NEGATIVE	• *electrons further from nucleus + more shielding* • *electron are attracted less strongly*
Periods	MORE NEGATIVE	• *increased nuclear charge attracts electrons* • *electron is easier to pull in*

MELTING POINT - *dependant on structure and bond type*

Groups	DECREASES	• *metallic bonding decreases as size increases* • *electron cloud isn't as effective at holding ions together*
Periods	VARIABLE	• *depends on structure and bonding - rises then falls* • *rises as metals contribute more electrons to the cloud* • *big rise for giant molecules in Group IV* • *drops for simple molecules with weak intermolecular forces*