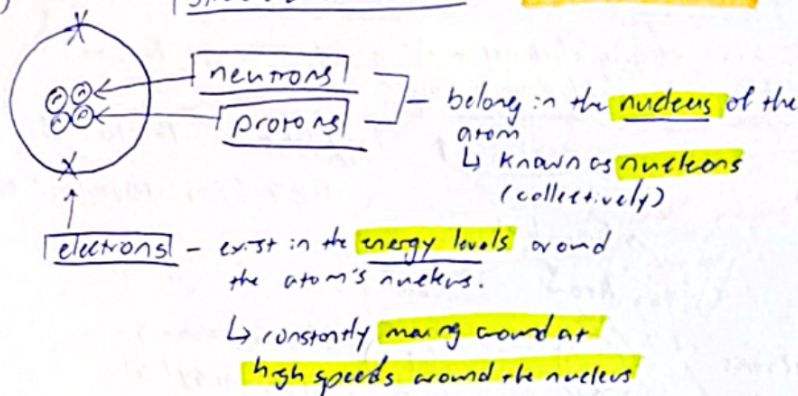


(Helium)



atoms are the smallest particles of an element that can exist

Relative charge:

protons: +1 (positive)
neutrons: 0 (no charge; neutral)
electrons: -1 (negative)

Relative mass

protons: 1
neutrons: 1
electrons: $\frac{1}{1840}$

OR: $\frac{1}{1836}$ depending on school syllabus.

Proton number (aka Atomic number)

↳ **number of PROTONS** there are in an atom

↳ also the number of electrons in an atom because

★ **Atoms are electrically neutral** Answer technique!

① Protons have a relative charge of +1, and electrons have a relative charge of -1.

② Therefore, to achieve an electrically neutral atom, the NO. OF PROTONS = NO. OF ELECTRONS.

Nucleon number (aka mass number)

↳ **number of NUCLEONS** in an atom

neutrons + protons

It's also the mass of the whole atom.

→ Electrons have a relative mass of $\frac{1}{1840}$

⇒ too small so it's negligible

∴ We only take protons & neutrons masses into consideration for mass.

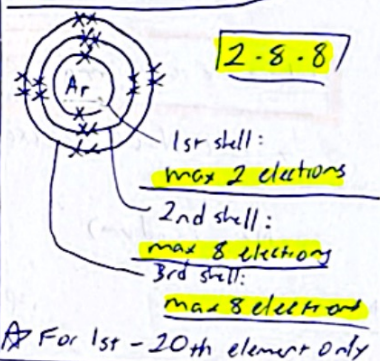
Reading the Periodic Table

2 ← proton number
He ← symbol of element
Helium ← name of element
4 ← nucleon number

Nuclide notation

← nucleon number
He → chemical symbol
2 ← proton number

Electronic Structure



ISOTOPEs

↳ Definition: atoms of the same element with the same number of protons but different no. of neutrons.

↳ **BASICALLY:** same proton no., different neutron no.

Most elements have isotopes.

because all atoms of the same element will have the same no. of protons

eg. Chlorine

Chlorine-35 Chlorine-37

$^{35}_{17}\text{Cl}$ $^{37}_{17}\text{Cl}$

↑ ↑

18 neutrons 20 neutrons

Isotopes have...

- **Similar chemical properties**

↳ Valence electrons determine chemical properties, electron structure & valence electrons is same across isotopes of the same element.

- **Slightly diff. physical properties**

↳ mass considers neutrons too
⇒ density, Mp, BP diff.

relative atomic mass

$(\% \text{ abundance} \times \text{mass of isotope A}) + (\% \text{ abundance} \times \text{mass of isotope B})$

Chemical Bonding

→ why:
 ↳ achieve stable noble gas configuration
 ↳ have full valence electron shell.
 ↑
 outermost shell.

EXAM KEYWORD

① IONIC BONDING

Definition: Strong electrostatic forces of attraction between oppositely charged ions.

★ IONIC BONDING IS BETWEEN Metals & Non-metals

What is an ION?

↳ What atoms lose/gain electrons to achieve a full valence shell,
 ↳ no. of protons ≠ no. of electrons
 ↳ charges don't completely cancel out.

Eg. Lithium

Atom



3p
3e } charges cancel out

Ion



3p
2e

(loses one electron)

1st. energy level:
max 2 - fulfilled
full valence

$$(+3) + (-2)$$

$$= +1$$

⇒ Lithium ion is a positive ion (cation)

Ions
 cations → positive charge ($p > e$)
 anions → negative charge ($e > p$)

As atoms, they have 1-4 electrons

As atoms, they have 5-7 electrons

easier to gain than lose

easier to lose than gain

Answer structure

- ① Metal atom loses valence electron to form ____.
- ② Non-metal atom gains valence electrons to form ____.

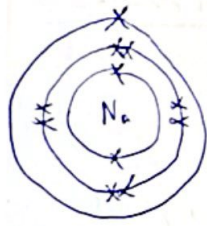
How are ionic bonds formed?

★ TRANSFER electrons

↳ Take NaCl for example.

Na (sodium)

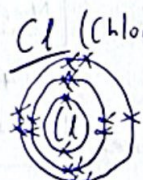
Atom



full valence shell

represent charges: don't put + (just +)

now it's a cation (pos. charge)



Cl (Chlorine)



Represent added electrons w/ outer symbols from sodium.

③ attracted to each other bc of opposite charges, stuck together due to STRONG (valence shell only) ELECTROSTATIC F.O.A.

negative chlorine

positive sodium

opposite charges

+1

→ attract

-1

∴ they're bonded.

very strong bond

PROPERTIES OF IONIC COMPOUNDS

↳ Structure: giant ionic crystal lattice (held together by very strong ionic bonds)

→ high MP & BP

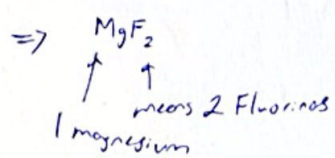
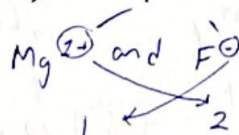
↳ lots of energy needed to break the very strong electrostatic F.O.A.

→ molten/aqueous: good electrical conductors
 solid: poor

BALANCING CHEMICAL EQN

Swap & Drop method.

⇒ you need 2- to cancel out 2+



COVALENT BONDING

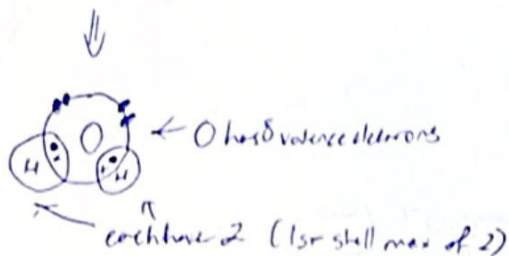
Definition: Covalent bond is the strong electrostatic F_oA between the positive nuclei and shared pair of electrons of the atoms in the covalent substance.

SHARE electrons

↳ by sharing, each atom gets a full valence shell.

Simple covalent molecules

→ eg: H_2O (water)



PROPERTIES

molecules are

NOT charged.

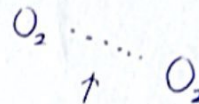
(electrically neutral)

→ NO ions, NO mobile electrons

↑
poor conductors of electricity.

→ low MP/BP

↳ weak intermolecular F_oA.



weak
van der
Waals forces

→ easy, low energy to break.