Chemical Bonding

↓ WHY?

to attain stable noble gas electronic configuration

- octet → $8e^-$
- duplet → $2e^-$
- noble gas:
  - inert → used in light bulbs
  - unreactive
  - stable

↓ HOW?

Lose, gain or share e^- (take part in chemical reactions (nucleus does not))

- lose, gain → form ions
  - ions: charged particle

only no. of e^- changes

IONS vs **ATOMS**

IONS: charged (+ve or -ve)

ATOMS: neutral

no. of protons ≠ no. of e^- (+ve) (-ve)

no. of protons remains the same

ATOMS: no. of protons = no. of e^- (+ve) (-ve)

if: no of p > no. of e^-

↳ +vely charged

↓

CATION → ca(+)ion

↓

positively charged

can have various charges on ions

↓

transition metals

if: no. of e^- > no. of p

↳ -vely charged

↓

ANION

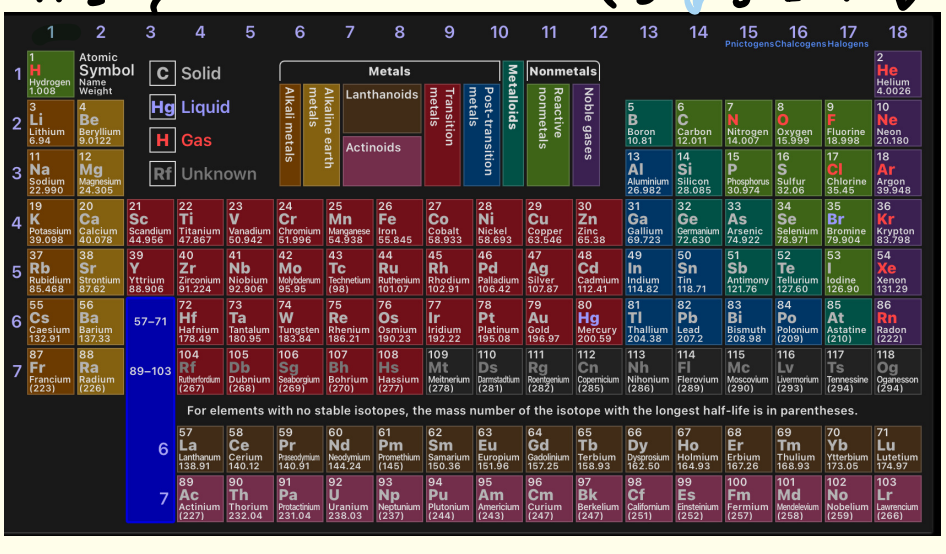
takes part in covalent bonding (chapter 5)

↓

doesn't really react

1+ 2+ 3+ 3- 2- 1-

noble gases



★ link to periodic table

written above are charges on the ions that the elements in that group have.

1+, 2+, 3+ → metals (cations)

3-, 2-, 1- → non-metals (anions)

eg.

Na (sodium)

electronic configuration : 2,8,1

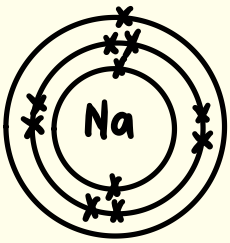
↓ $-1e^-$

2,8

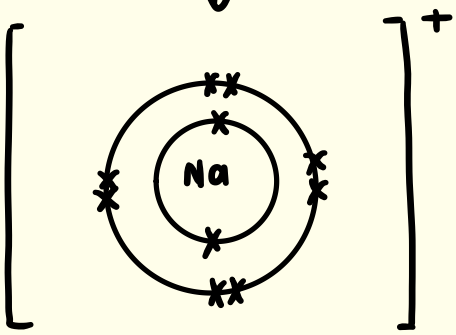
↓

Stable

(looks like electron config of Ne)



$-e^-$ → in ionic bonding this e^- can be given to a non-metal so it can form an anion



since no. of p = 11, and now no. of e^- = 10,

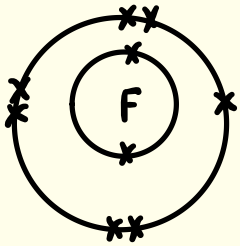
no. of p > no. of e^-

↳ +vely charged

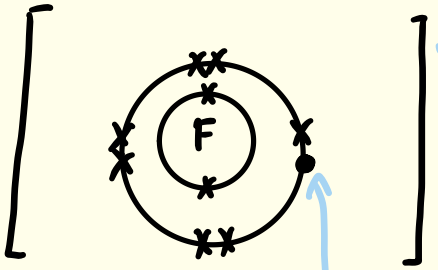
↳ cation

F (fluorine)

elec. config: 2,7 $\xrightarrow{+e^-}$ 2,8



$+e^-$ =



don't need to put 1

charge written outside bracket

e^- given by metal during ionic bonding

no. of p = 9, no. of e = 10

no. of e > no. of p

↓

anion

TRY: draw dot-and-cross diagram of the ions of Nitrogen and magnesium. Include all electrons (ans at the end)

IONIC BONDING

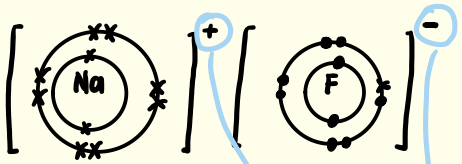
metal + non-metal

gain and loss of e^-

opposite charges attract

eg. NaF (sodium fluoride)

take note of spelling



attract each other

legend:
x rep Na e^-
• rep F e^-

ionic compounds have no net charge

+ve = -ve

What about $MgCl_2$?

only one e^-

but 2 e^- can be given! → so hence, Cl x 2!

↓

because ionic compounds are NEUTRAL

VS

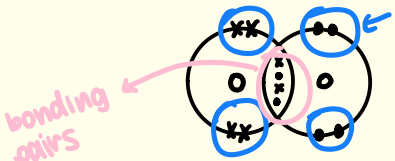
COVALENT BONDING

non-metal + non-metal

sharing of e^-

diatomic molecule

Eg. O_2 (only valence shells will be shown)



O=O

2 pairs of e^- are bonded together

elec config. of O: 2,6

↓

6 valence e^-

↓

need 2 more e^-

if 2 electrons (1 pair) is given from each O atom, they can share them, allowing them to each attain stable noble gas electronic configuration.

↓ How?

electrons move very quickly in their valence shells → the 2 valence shells are interconnected → all 4 e^- move from one valence shell to another very quickly → both atom's valence shell will always have 8 e^-

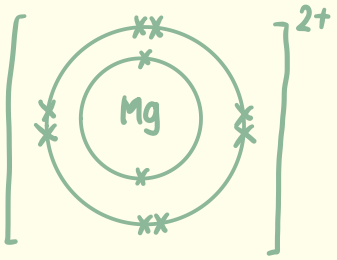
What if only one e^- is given by each O atom?

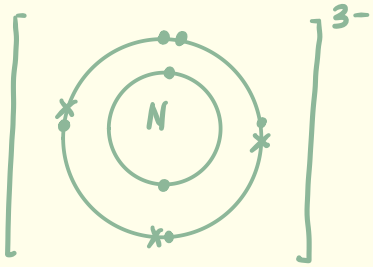
→ one pair still unbonded

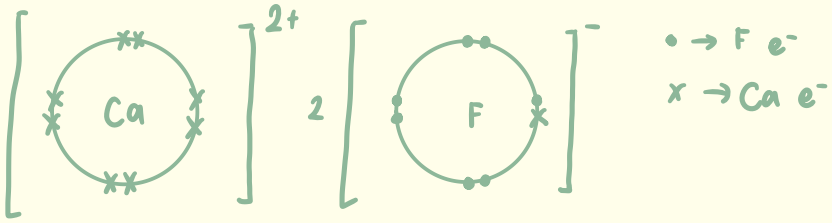
TRY: Draw the dot-and-cross diagram of bonding between Ca and F (ionic), and CO_2 (covalent).

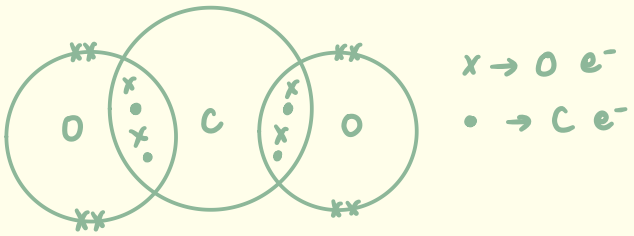
(show only valence electrons)

ANSWERS









trick for checking your answer of covalent bonding:

cover the atoms until only one is seen (make sure bonding pairs can be seen). Count no. of e⁻ and make sure there are 8. do this for each atom.