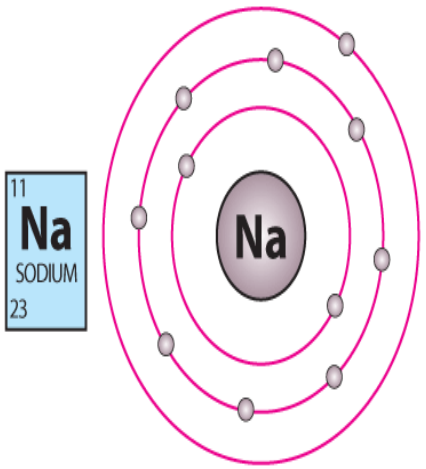
Chemical Bonding

Ionic Bonding

- This occurs when one atom loses electrons and another atom gains electrons in order to achieve a full outer shell
- When atoms lose or gain electrons they become ions
- Opposite charges attract

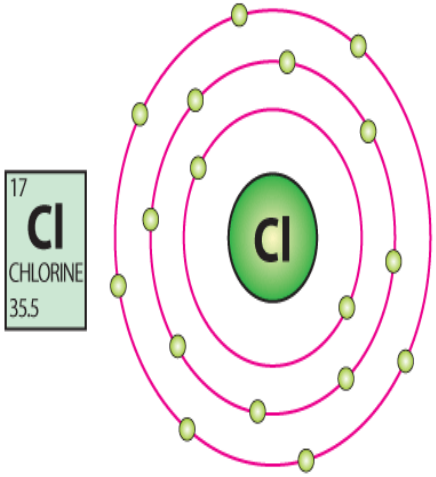
Sodium atom



11 protons +11
11 electrons –11
Overall charge = 0

▲ Fig 23.3 Sodium, 11 electrons, electronic configuration (2, 8, 1)
Wants to lose one electron

Chlorine atom



17 protons + 17
17 electrons –17
Overall charge = 0

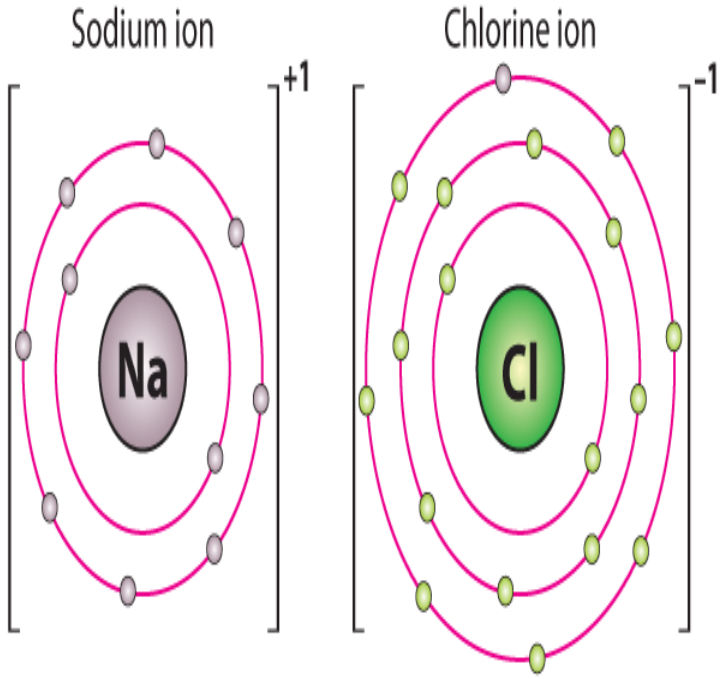
▲ Fig 23.4 Chlorine, 17 electrons, electronic configuration (2, 8, 7)
Wants to gain one electron

Sodium ion

11 protons = + 11

10 electrons = –10

Overall charge = +1



Chloride ion

17 protons = + 17

18 electrons = –18

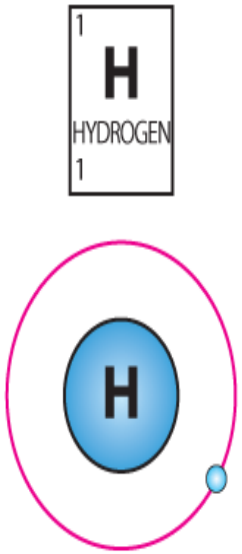
Overall charge = –1

▲ Fig 23.5 Na^{+1} (2, 8) Cl^{-1} (2, 8, 8)

Covalent bonding

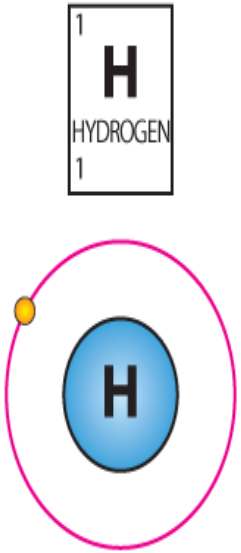
- A covalent bond consists of a pair of electrons being shared between two non-metal atoms

- Consider these two hydrogen atoms



Electronic configuration (1)

Fig 23.9 Hydrogen atom



Electronic configuration (1)

Fig 23.10 Hydrogen atom

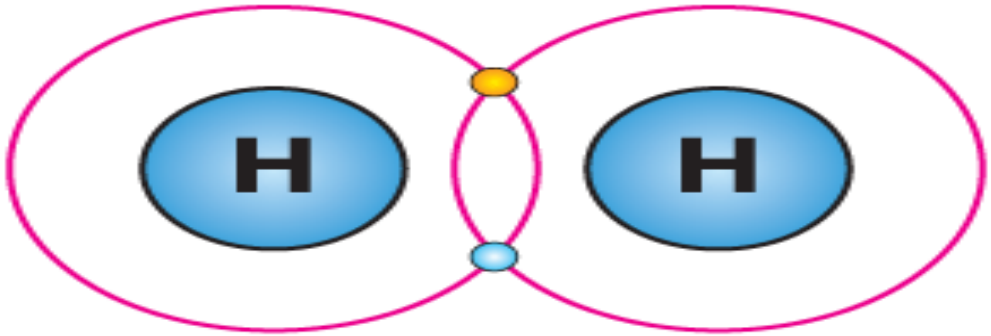


Fig 23.11 Hydrogen molecule single bond

- Both hydrogen atoms want to gain one electron to achieve a full shell, so they overlap their shells and share their electrons

- They have formed a covalent bond

water

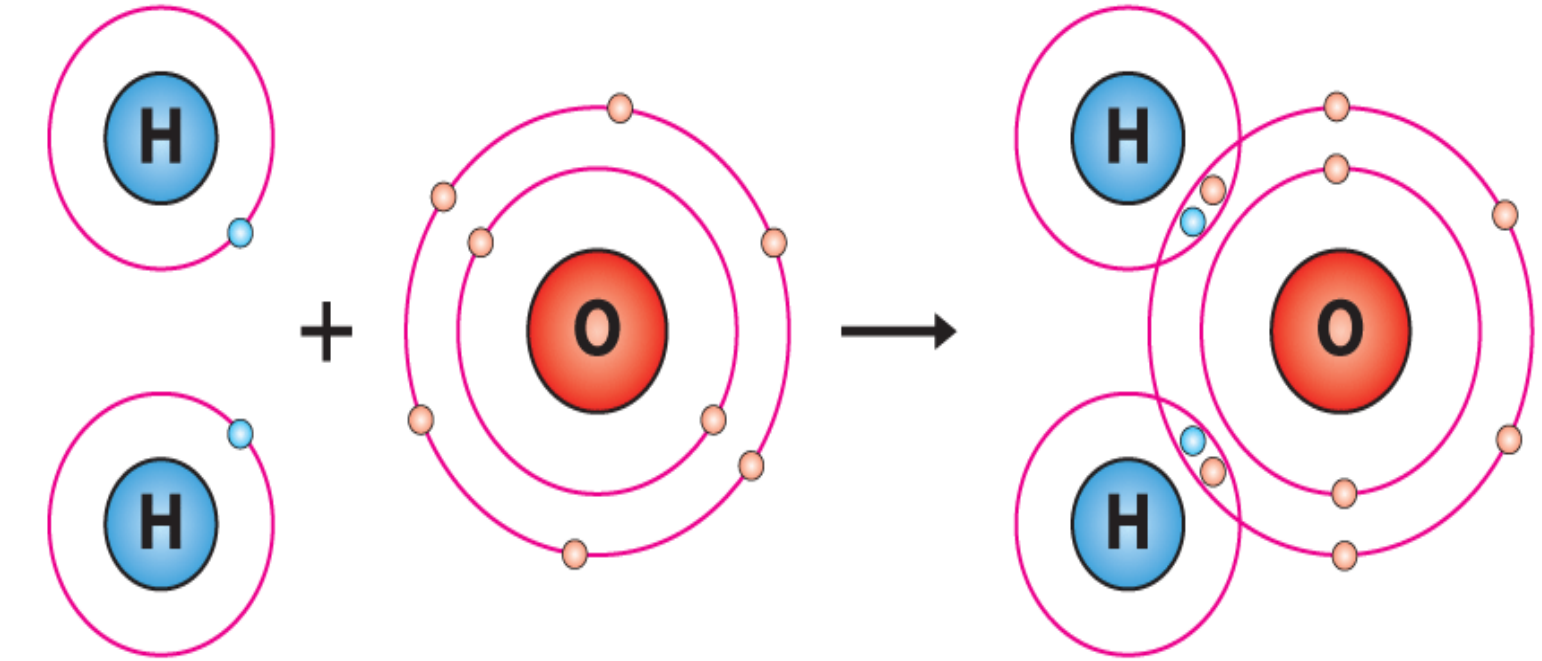
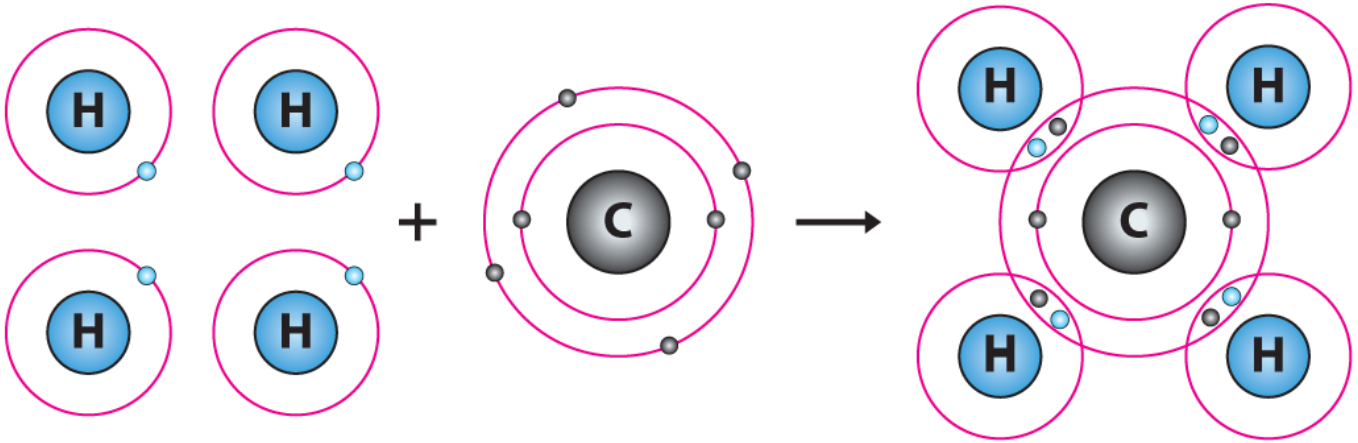


Fig 23. 14 A covalent bond

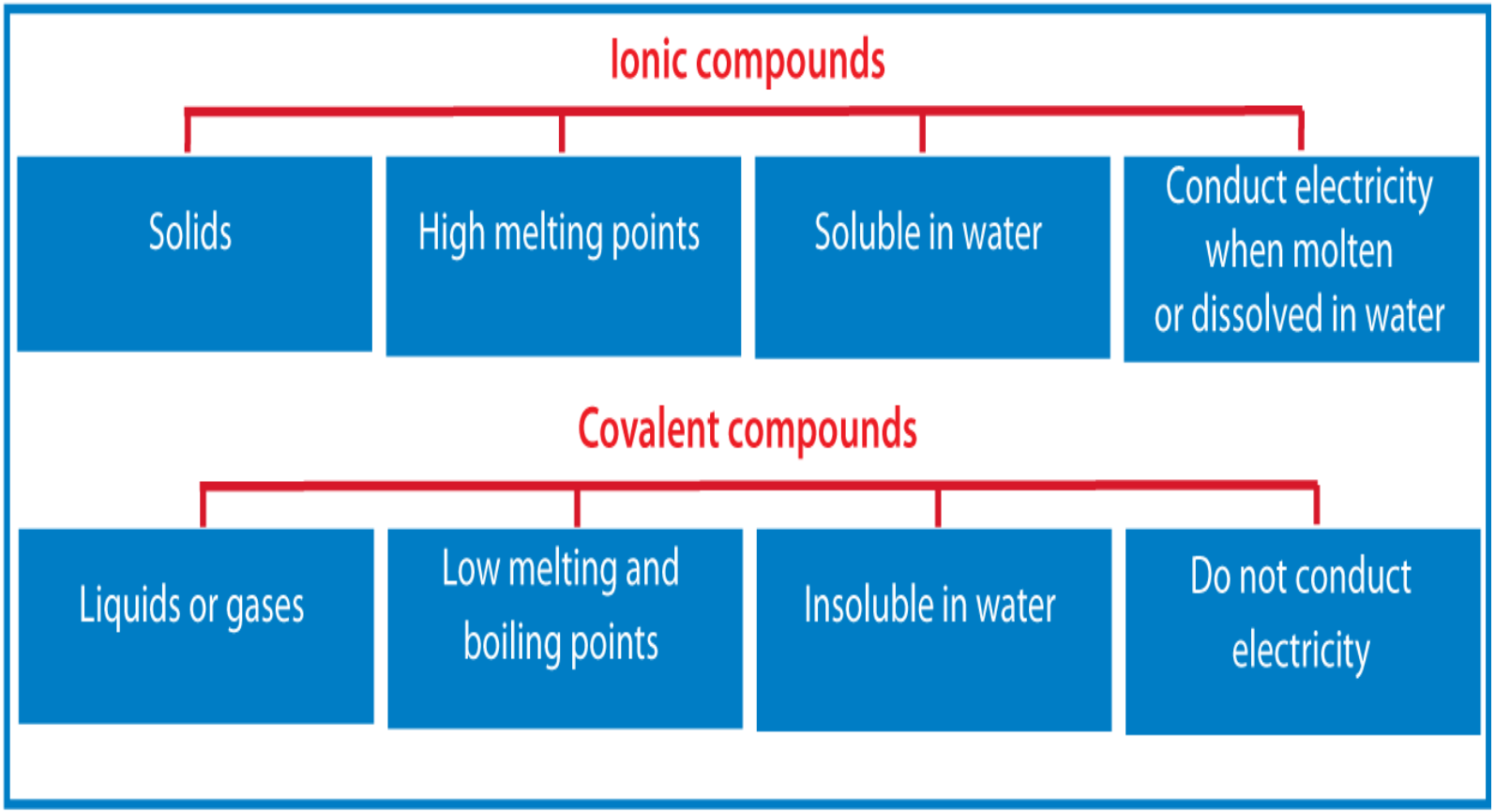
methane



Hydrogen atoms Carbon atom Methane molecule (CH_4)

▲ Fig 23.17 Covalent bonding in methane

Properties of Ionic and Covalent bonds



Ion

- An ion is a charged atom

Valency

- Valency is the amount of electrons an atom gains or loses when trying to become stable