

AS WS 10.3(1)

WORKSHEET ON CHEMICAL BONDING

IONIC BONDING

Ions are formed where electrons are transferred from the valence shell of one atom (usually a metal) to the valence shell of another atom (non-metal) so that both end up with Noble Gas configurations. Assume, in the first instance, that compounds between reactive metals and reactive non-metals will be ionic.

When drawing “dot and cross” diagrams, show each ion separately in square brackets with the charge outside at the top right hand corner.

1) Draw “before” and “after” diagrams (outer electrons only) to show how ionic bonding takes place in the following compounds:-

- a) Lithium fluoride – LiF
- b) Magnesium sulphide – MgS
- c) Calcium chloride – CaCl₂
- d) Sodium oxide – Na₂O
- e) Aluminium oxide – Al₂O₃
- f) Magnesium nitride – Mg₃N₂

COVALENT BONDING

Covalent bonding involves the sharing of electron pairs between two atoms. This is most often between non-metal atoms (but there are a number of compounds between metals and non-metals that are covalent). A single covalent bond involves one shared pair of electrons. In many compounds, atoms will share electrons to enable their valence shell to become like the nearest Noble Gas. This is normally 8 electrons (the “Octet Rule”), apart from Hydrogen. There are exceptions (see next section).

2) Draw “dot and cross” diagrams (outer electrons only) to show the bonding in the following covalent molecules:-

- a) Hydrogen fluoride – HF
- b) Chlorine – Cl₂
- c) Oxygen – O₂
- d) Nitrogen – N₂
- e) Silicon tetrachloride – SiCl₄
- f) Ammonia – NH₃
- g) Carbon dioxide – CO₂
- h) Hydrogen cyanide – HCN
- i) Ethane – C₂H₆
- j) Ethene – C₂H₄