

Work through the ChemCAL module "*Covalent Bonding*"

- Using the water molecule to illustrate your answers, define the following terms.
 - bonding pair
 - non-bonding pair
 - valence level electrons
- Use the concept of valence to identify which of the following are unlikely to exist. Write down the *empirical formulae* of the remainder.

CH_3 , C_2H_6 , NI_3 , NCl , C_2H_2
- Which of the following species are unsaturated?

CS_2 , CH_4 , H_2O , CH_2CH_2
- The atoms in both iodine and diamond are joined by covalent bonds. However, iodine is a soft, low-melting point solid while diamond is very hard and has an extremely high melting point. Account for these differences in properties.
- How does ionic bonding differ from covalent bonding?
- Using the concept of metallic bonding, explain the following.
 - metals are good conductors of electricity
 - metals can be bent without breaking and are malleable.
- Balance the following chemical equations.
 - $\text{K} + \text{Cl}_2 \rightarrow \text{KCl}$
 - $\text{Ba} + \text{H}_2\text{O} \rightarrow \text{Ba}(\text{OH})_2 + \text{H}_2$
 - $\text{H}_2\text{S} + \text{O}_2 \rightarrow \text{H}_2\text{O} + \text{SO}_2$
 - $\text{C}_2\text{H}_6 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
 - $\text{Li} + \text{N}_2 \rightarrow \text{Li}_3\text{N}$
 - $\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow \text{Fe} + \text{CO}_2$
 - $\text{Al} + \text{O}_2 \rightarrow \text{Al}_2\text{O}_3$
 - $\text{C}_6\text{H}_{14} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- Write *ionic* equations for any reactions that occur when the following are mixed. The solubilities of these compounds can be found at:
<http://firstyear.chem.usyd.edu.au/Quiz/SolubilityRules.pdf>.
 - Water solutions of sodium sulfate and barium chloride
 - Water solutions of potassium hydroxide and copper(II) nitrate
 - Water solutions of silver nitrate and sodium chloride
 - Water solutions of cobalt(II) sulfate and ammonium carbonate