

SL & HL Answers to Covalent bonding questions

1. Oxygen has the electron configuration $1s^22s^22p^4$. When two oxygen atoms combine to form oxygen gas each atom needs to share two more electrons so the bond between the atoms is made from two shared pairs of electrons so that each atom attains the electron configuration a noble gas.

Nitrogen has the electron configuration $1s^22s^22p^3$. Each nitrogen atom needs to share three electrons with the other nitrogen atom to form a triple bond (three shared pairs of electrons) between the two atoms so that both achieve a noble gas electron configuration.

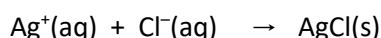
2. The oxygen atom in water contains two non-bonding pairs of electrons. One of these forms a coordinate bond with the proton (which is extremely small as it has no electrons).

3. Ethyne contains a triple covalent bond whereas ethene contains a double covalent bond between the carbon atoms. The more electron pairs involved in the bonding the stronger and shorter the bond as the two nuclei are attracted more strongly together.

4. Ethanoic acid contains one C=O double bond and one C-O single bond. The double bond is shorter than the single bond.

5. Chlorine (3.2) is more electronegative than carbon (2.6). This means the shared pair of bonding electrons is closer to the chlorine atom resulting in a polar bond.

6. The white precipitate is silver chloride formed from the reaction of silver ions with chloride ions.



All the chlorine atoms in tetrachloromethane are covalently bonded so no chloride ions are present to precipitate with silver ions.

7. C=O bonds are polar due to the greater electronegativity of oxygen compared to carbon so the electrons in the C=O bond are drawn closer to the oxygen atom. The carbon dioxide molecule is non-polar as the resultant polarity of the two oppositely opposed dipoles from the two C=O bonds is zero.

8. Water is a polar molecule as it has a bent shape and polar O-H bonds. These are given energy by the oscillating microwaves as they continually try to line up with the field and so heat up.

Tetrachloromethane is made up of non-polar molecule as the resultant polarity of the four symmetrical C-Cl bonds is zero. The molecules are thus unaffected by the microwave radiation.

