Simple covalent structures consist of individual molecules held together by only weak forces. They arise when non-metallic elements combine with other non-metallic elements.

Covalent structures have the following properties:

* Low melting points
* Soft solids or liquids or gases at Room Temperature (RT)
* Insoluble in water
* Non-conductors

Microscopic reasons for properties

* Covalent substances have only weak forces between the molecules.
* Covalent substances have neutral molecules and water cannot be attracted to them.
* Covalent substances tend to dissolve in non-polar solvents.
* Covalent substances contain no charged particles with which to carry electrical current.

**Exercise – Covalent bonding**

Draw the dot-cross electronic and displayed structures of the following covalent molecules. Notice that all of the molecules have only non-metallic elements involved. The first one is done for you as an example:

**Example**: Hydrogen, H2. Each hydrogen atom has an electronic configuration of (1). This means that it needs to gain one more electron to attain a full outer shell. It can do this by sharing 1 pair of electrons. Dot cross structure H:H, or displayed structure H-H.

1. Hydrogen, H2

2. Oxygen, O2

3. Water, H2O

4. Methane, CH4

5. Carbon dioxide, CO2

6. Hydrogen peroxide, H2O2

7. Chlorine, Cl2

8. Nitrogen, N2

9. Ammonia, NH3

10. Hydrogen chloride, HCl

11. Hydrogen sulfide, H2S

12. Hydrogen cyanide, HCN

13. Phosgene, COCl2

14. Methanol, CH3OH

15. Hydrazine, N2H4

16. Ethane, C2H6

17. Ethene, C2H4

18. Ozone, O3

19. Methanoic acid, HCO2H

20. Phosphine, PH3