Quiz (Formation of Van der Waals' forces)

1. Some molecules, like hydrogen sulphide, are polar while some, like oxygen, are not.
   (a) Explain why the hydrogen sulphide molecule is polar.

   (b) Explain why the oxygen molecule is non-polar.

   (c) How would the electron distribution in an oxygen molecule change when a hydrogen sulphide molecule is nearby?

   (d) With the aid of a diagram, briefly describe the van der Waals' forces between a hydrogen sulphide molecule and an oxygen molecule.

2. Consider two molecules: Cl_2 and HBr.
   (a) Which one is a polar molecule? Explain briefly.

   (b) Which one is a non-polar molecule? Explain briefly.

   (c) How would the electron distribution in a Cl_2 molecule change when an HBr molecule is nearby?

   (d) Draw a labelled diagram to illustrate the intermolecular forces that exist between the Cl_2 and HBr molecules.

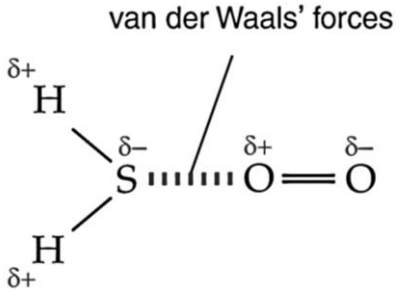
Suggested Answer

1. (a) Because of the large electronegativity difference between hydrogen and sulphur, the H–S bond in the hydrogen sulphide molecule is polar. However, the polarities of the two polar H–S bonds cannot cancel out each other. Thus, the molecule is polar.

   (b) This is because there is only one O=O bond, which is non-polar, in the oxygen molecule. Thus, the molecule is non-polar.

   (c) The hydrogen sulphide molecule has a positive end and a negative end. The electrons in the oxygen molecule would be drawn towards the positive end of the hydrogen sulphide molecule.

   (d) The van der Waals' forces between a hydrogen sulphide molecule and an oxygen molecule result from the attraction between the negative end of the hydrogen sulphide molecule and the induced positive end of the oxygen molecule.



2. (a) HBr.
   Due to the large electronegativity difference between Br and H, the H–Br bond is polar. There is only one H–Br bond in the molecule. Thus, the HBr molecule is polar.

   (b) Cl_2.
   There is only one Cl–Cl bond, which is non-polar, in the Cl_2 molecule. Thus, the molecule is non-polar.

   (c) The HBr molecule has a positive end and a negative end. The electrons in the Cl_2 molecule would be drawn towards the positive end of the HBr molecule.
   As a result, there are more electrons on one side of the Cl_2 molecule than on the other side.

   (d)