

WJEC (Wales) Chemistry

A-level

Topic C1.4 - Bonding

Flashcards

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What is an ionic bond?



What is an ionic bond?

A bond between a positive and negative ion. The ions are held together by strong electrostatic attraction.



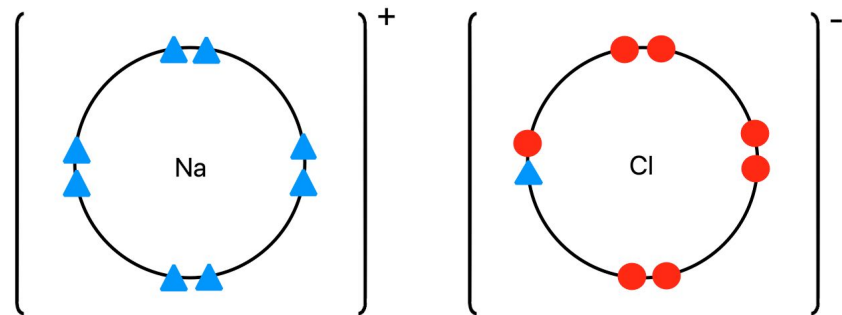
Draw a dot-and-cross diagram for the ionic compound NaCl



Draw a dot-and-cross diagram for the ionic compound NaCl

The sodium atom has lost one electron to form a sodium ion, Na^+ .

The chlorine atom has gained this electron to form a chloride ion, Cl^- .



What is an ionic crystal?



What is an ionic crystal?

A giant lattice of ions, held together by the electrostatic attraction of oppositely charged ions.



Why do ionic compounds have high melting points?



Why do ionic compounds have high melting points?

Ionic compounds have strong electrostatic attraction between the oppositely charged ions which requires a lot of energy to break and is required to melt the compound. Therefore, ionic compounds have high melting points.



What is a covalent bond?



What is a covalent bond?

A bond formed that involves the sharing of electron pairs between atoms.

It forms due to the electrostatic attraction between the positive nuclei of the bonded atoms and the negative electrons which are between the two nuclei.



What is a dative covalent bond?



What is a dative covalent bond?

A type of covalent bond whereby both electrons in the shared pair are donated by one of the bonding atoms only.



Define electronegativity



Define electronegativity

The power of an atom to attract the electron density in a covalent bond towards itself.



Define bond polarity



Define bond polarity

Bond polarity refers to the separation of electric charge along a bond. Polar bonds arise when the electrons in the bond are not shared equally.



Explain what is meant by a temporary dipole



Explain what is meant by a temporary dipole

Electrons are constantly moving around the nucleus. At any one time there will be an uneven distribution of electrons, making one half of the molecule more negatively charged than the other. This creates a temporary dipole.



Explain what is meant by a permanent dipole



Explain what is meant by a permanent dipole

If two atoms that are covalently bonded have different electronegativities, a polar bond forms. The more electronegative atom draws more of the negative charge towards itself and away from other atom, producing a δ^- region and a δ^+ region. This is a permanent dipole.



Explain what is meant by an induced dipole



Explain what is meant by an induced dipole

An induced dipole is created when electron distribution around a molecule is influenced by a charged particle.



Compare the bond character in a covalent bond, intermediate bond and ionic bond



Compare the bond character in a covalent bond, intermediate bond and ionic bond

Covalent bond - electrons shared equally between atoms, leading to no overall charge.

Intermediate bond - electrons shared unequally so there are partial charges on the atoms.

Ionic bond - complete transfer of electrons between atoms to produce ions with full charges.



What types of intermolecular forces are there?



What types of intermolecular forces are there?

- Temporary dipole interactions
- Permanent dipole interactions
- Hydrogen bonding



How do temporary dipole interactions occur between molecules?



How do temporary dipole interactions occur between molecules?

There is an uneven distribution of electrons around the molecule. This creates an uneven distribution of charge, which creates a temporary dipole in the molecule. The temporary dipoles induce dipoles in neighbouring molecules.



What is a permanent dipole-dipole interaction?



What is a permanent dipole-dipole interaction?

The electrostatic attraction between oppositely charged permanent dipoles of neighbouring molecules.

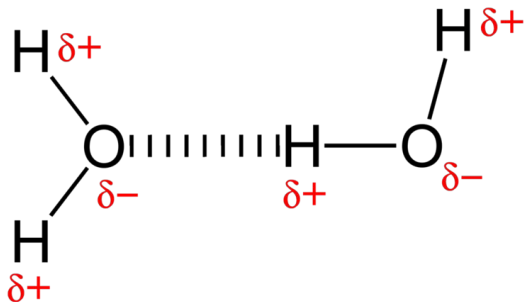


What are hydrogen bonds?



What are hydrogen bonds?

Hydrogen bonds are the electrostatic attraction between electron deficient hydrogens and a highly electronegative atom - commonly nitrogen, fluorine or oxygen.



Why does water have a high melting and boiling point?



Why does water have a high melting and boiling point?

Hydrogen bonds form between water molecules due to the electronegative oxygen and the slightly positive hydrogen atom. Hydrogen bonds require a lot of energy to break.



Why are alcohols soluble in water?



Why are alcohols soluble in water?

Alcohols form hydrogen bonds with the water molecules due to the electronegative oxygen being bonded to a hydrogen in the -OH group. This makes them soluble in water.



How can the electron pair repulsion theory be used to predict the shapes of simple molecules and ions?



How can the electron pair repulsion theory be used to predict the shapes of simple molecules and ions?

The shape of a molecule is determined by the arrangement of electron pairs around the central atom. The electron pairs repel which lead to specific shapes depending on how many electron pairs are present. There is greater repulsion between lone pairs compared with bonding pairs.

Relative repulsion:

Lone pair-lone pair > lone pair-bonding pair > bonding pair-bonding pair



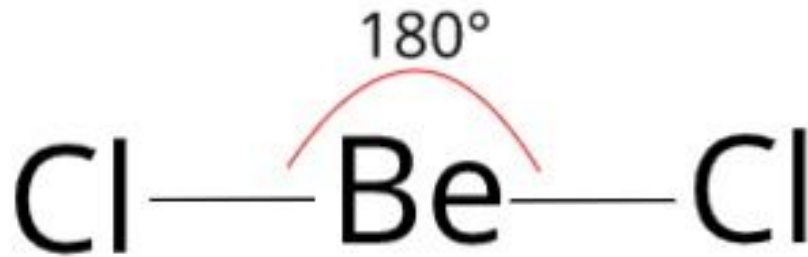
Name the shape of BeCl_2 .
What is the bond angle?



Name the shape of BeCl_2 . What is the bond angle?

Linear

Angle = 180°



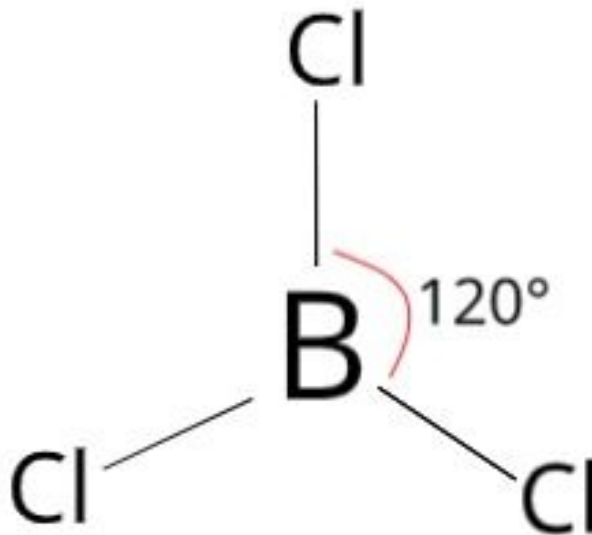
Name the shape of BCl_3 .
What is the bond angle?



Name the shape of BCl_3 . What is the bond angle?

Trigonal planar

Angle = 120°



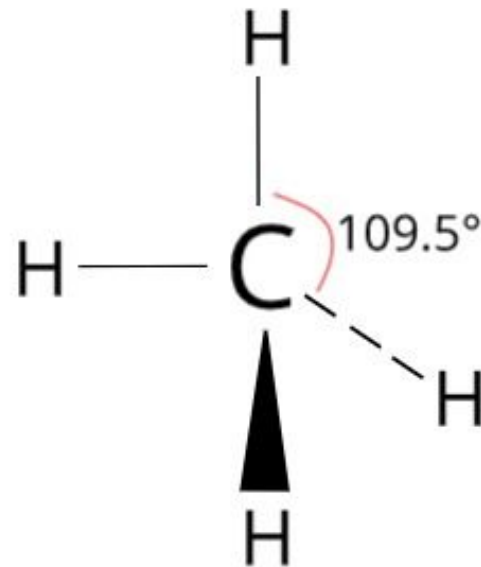
Name the shape of CH_4 .
What is the bond angle?



Name the shape of CH_4 . What is the bond angle?

Tetrahedral

Angle = 109.5°



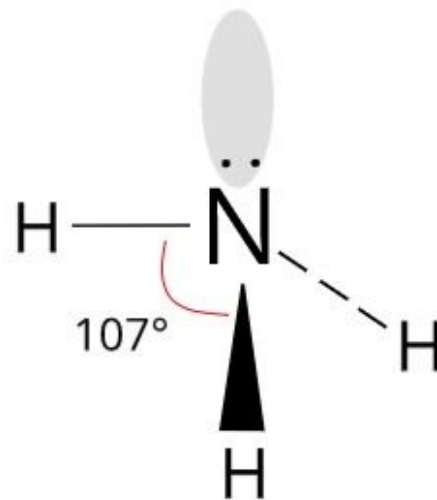
Name the shape of NH_3 .
What is the bond angle?



Name the shape of NH_3 . What is the bond angle?

Trigonal pyramidal

Bond angle = 107°



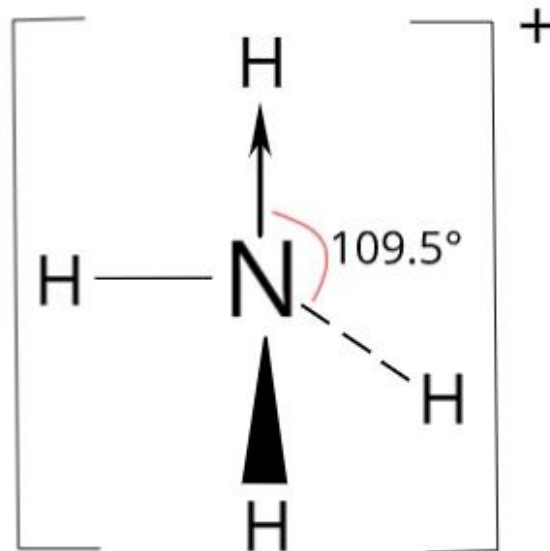
Name the shape of NH_4^+ .
What is the bond angle?



Name the shape of NH_4^+ . What is the bond angle?

Tetrahedral

Bond angle = 109.5°



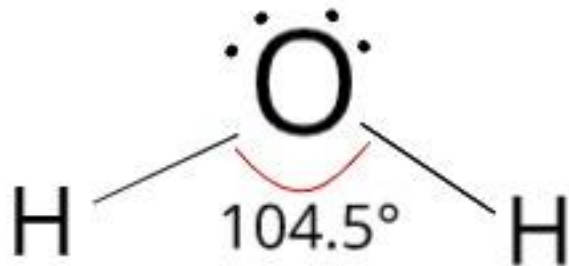
Name the shape of H_2O .
What is the bond angle?



Name the shape of H_2O . What is the bond angle?

Bent

Bond angle = 104.5°



Name the shape of SF_6 .
What is the bond angle?



Name the shape of SF_6 . What is the bond angle?

Octahedral

Bond angle = 90°

