

MOLECULAR SUBSTANCES

Answer all the questions below then check your answers

1. What is a molecule?

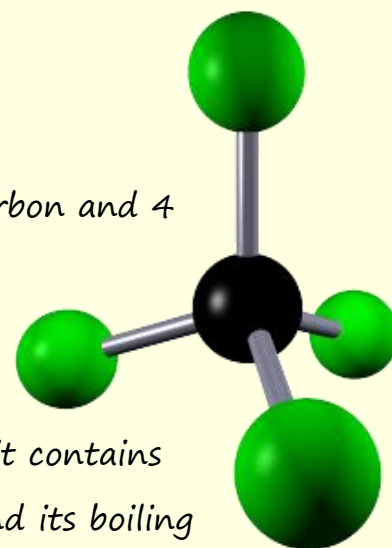
2. What is a covalent bond?

a. Are covalent bonds strong or weak?

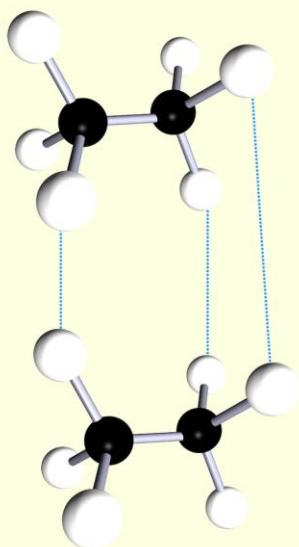
3. The molecule shown opposite contains 1 atom of carbon and 4 atoms of chlorine, it is called carbon tetrachloride.

a. What is its molecular formula?

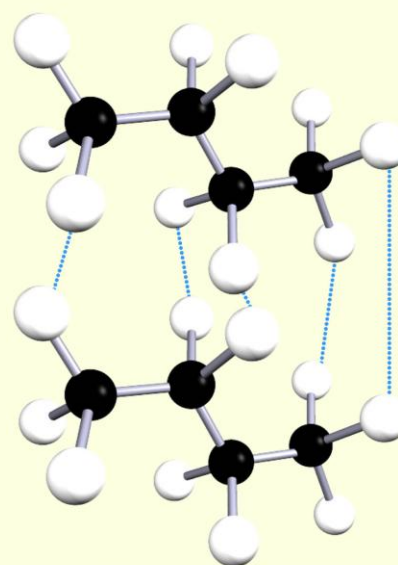
b. Carbon tetrachloride is a simple covalent molecule, it contains strong covalent bonds. Its melting point is -22°C and its boiling point is 77°C , if the covalent bonds are so strong why is its melting and boiling points so low?



4. The image below shows two the types of bonding that occur between ethane and butane molecules.



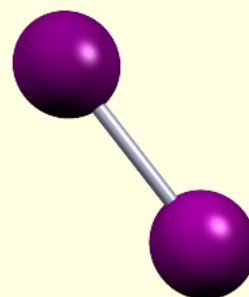
ethane molecules (C_2H_6)



butane molecules (C_4H_{10})

- a. What type of bonding is shown by the blue dotted lines?
- b. What type of bonding is shown by the grey bars or lines?
- c. Which of the two molecules shown will have the strongest intermolecular bonding?
- d. What factors influence the strength of the intermolecular bonding?

5. Iodine is a small diatomic molecule which is a solid at room temperature. Solid iodine sublimes when heated.



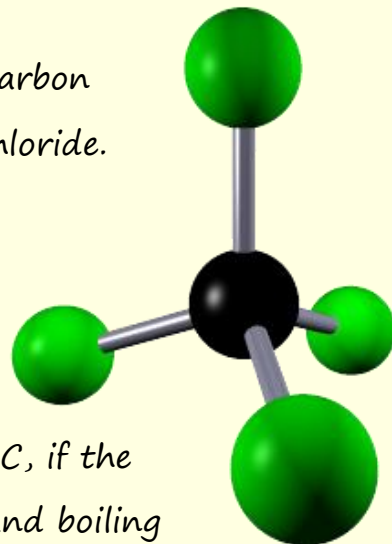
- a. What is a diatomic molecule?
- b. What would you normally expect to happen to a solid when it is heated?
- c. What does sublimation mean?
- d. Explain why solid iodine sublimes when heated instead of melting as you might expect.

Answers

1. What is a molecule? *Small group of atoms*
2. What is a covalent bond? *Two atoms equally sharing a pair of electrons.*
 - a. Are covalent bonds strong or weak? *strong*

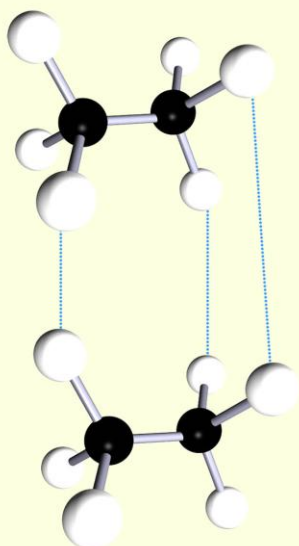
3 The molecule shown opposite contains 1 atom of carbon and 4 atoms of chlorine, it is called carbon tetrachloride.

- a. What is its molecular formula? *CCl_4*
- b. Carbon tetrachloride is a simple covalent molecule, it contains strong covalent bonds. Its melting point is $-22^{\circ}C$ and its boiling point is $77^{\circ}C$, if the covalent bonds are so strong why are its melting and boiling points so low?

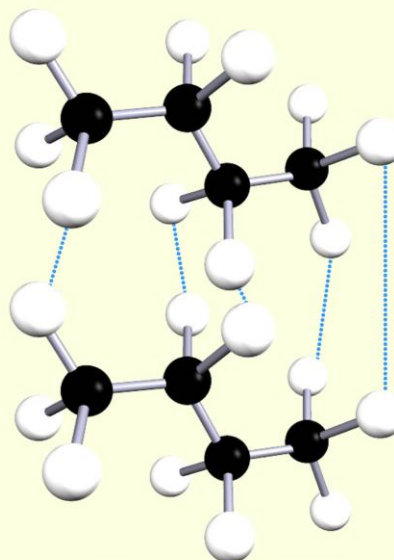


It is a small molecule with weak intermolecular bonds between the molecules. The fact that the covalent bonds are strong is irrelevant. This fact will not affect the melting or boiling points in any way.

4. The image below shows two the types of bonding that occur between ethane and butane molecules.



ethane molecules (C_2H_6)



butane molecules (C_4H_{10})

- a. What type of bonding is shown by the blue dotted lines? *The intermolecular bonding/Van der Waals bonding*
- b. What type of bonding is shown by the grey bars or lines? *Covalent bonds, the intramolecular bonds*
- c. Which of the two molecules shown will have the strongest intermolecular bonding? *The largest molecule with the most electrons- butane*
- d. What factors influence the strength of the intermolecular bonding?
Size of molecule, surface area of molecule, number of electrons in molecule
5. Iodine is a small diatomic molecule which is a solid at room temperature. Solid iodine sublimes when heated.
- a. What is a diatomic molecule? *Molecule consisting of 2 atoms*
- b. What would you normally expect to happen to a solid when it is heated? *It melts, turns from a solid to a liquid.*
- c. What does sublimation mean? *Turns straight from a solid to a gas without melting*
- d. Explain why solid iodine sublimes when heated instead of melting as you might expect. *Solid iodine consists of small diatomic molecules; these molecules have strong covalent bonds holding them together. Being large atoms the intermolecular bonding between iodine molecules is fairly strong. However when heated these intermolecular bonds break leaving the simple diatomic iodine molecules, being a small molecule made of only two atoms it will immediately forms a gas.*