Science(Chemistry)

Ionic Bonding I

Name: _____( ) Class: _____ Date: _____

Notes

1. Bonds are formed because the atoms that combine want to achieve the more stable **duplet or octet electronic structure (noble gas structure)**. The electronic structures of the noble gases are as follows:

a) Helium, He(2) – this is called the duplet structure. (has completely filled up the first and only outershell)

b) The octet structures of neon, Ne (2,8) of 10 electrons and argon, Ar (2,8,8) of 18 electrons.

2. Ionic bonds are formed between **metals** and **non-metals**.
   Example: between sodium and chlorine to form NaCl (sodium chloride)

a) The sodium atom (atom of metal) with electronic structure (2, 8, 1) **loses** its 1 outermost electron to become the more stable sodium ion, Na^+ with electronic structure (2, 8)

b) The chlorine atom (atom of non-metal) with electronic structure (2, 8, 7) **gains** an electron to become the more stable chloride ion, Cl^- (2, 8, 8)

c) The ions formed have stable electronic arrangements and are held together by their oppositely-charged strong electrostatic forces.

Characterisitcs of Ionic compounds

1. Consists of **ions** that are oppositely charged.
2. **Strong attractive forces** between particles (ions)
3. **Relatively high melting and boiling points**. They **are** crystalline **solids** at room temperature. (Mostly solids because of their high melting point and boiling point.)
   The oppositely charged ions are held together by very strong electrostatic forces of attraction which requires a lot of energy to overcome.
4. **Non-volatile** (cannot evaporate easily) because they have high melting point.
5. Usually **soluble in water**
6. **Conduct electricity in molten state or when dissolved in water** (aqueous state) because the ions are free to move so it can carry electric current. They make good electrolytes.
   In solid state, they **do not conduct electricity** because the ions are bonded together by strong electrostatic forces of attraction and can only vibrate about a fixed position.

EXERCISES

For Q1 t0 Q4: Fill in the blanks with the helping words.

negative	non-metals	noble gas structure	accept
positve	metals	give away	oppositely charged

1. **Ionic bonding** takes place between (i)_____ and (ii)_____.
2. During bonding, metal atoms (i)_____ electrons and change into (ii)_____ ions while non metal atoms (iii)_____ electrons and changes into (iv)_____ ions.
3. When there is a transfer of electrons between and non metal, they each achieve a _____ (e.g. a duplet or an octet structure) and become stable.
4. **Strong electrostatic forces of attraction** between the _____ ions form ionic bonding.

For Q5 t0 Q8: Fill in the blanks with the helping words.

Characteristics of Ionic Compounds

high	aqueous	solid	electricity
soluble	electrolvtes	molten	ions

5. Ionic compounds consist entirely of _____.
6. They are crystalline _____ at room temperatures, usually with _____ melting and boiling points.
7. They are strong _____. They conduct _____ in _____ and _____ states.
8. They are usually _____ in water.

9. Which of the following pairs is least likely to form an ionic compound?

   A potassium and chlorine B sodium and bromine
   C nitrogen and hydrogen D calcium and hydrogen

10. When a metal atom becomes an ion, it

    A loses electrons. B gain electrons.
    C decreases in mass number. D increases its proton number.

11. Four properties of compound X are given below. Which property best shows that X contains ionic bonds?

    A Compound X has a low melting point B Molten X conducts electricity
    C Compound X is insoluble in water D Solid X does not conduct electricity.