

Unit 4: Structure of Molecules

Exercise Questions

Exercise Multiple Choice Question Answer

1. **Atoms react with each other because:**
(a) They are attracted to each other. (b) They are short of electrons
(c) They want to attain stability (d) They want to disperse
2. **An atom having six electrons in its valence shell will achieve noble gas electronic configuration by:**
(a) Gaining one electron (b) Losing all electrons
(c) Gaining two electrons (d) Losing two electrons
1. **Considering the electronic configuration of atoms which atom with the given atomic number will be the most stable one?**
(a) 6 (b) 8 (c) 10 (d) 12
3. **Octet rule is:**
(a) Description of eight electrons (b) Picture of electronic configuration
(c) Pattern of electronic configuration (d) Attaining of eight electrons
4. **Transfer of electrons between atoms results in:**
(a) Metallic bonding (b) Ionic bonding
(c) Covalent bonding (d) Coordinate covalent bonding
1. **When an electronegative element combines with electropositive element the type of bonding is:**
(a) Covalent (b) Ionic
(c) Polar covalent (d) Coordinate covalent
5. **A bond formed between two non-metals is expected to be:**
(a) Covalent (b) ionic (c) Coordinate covalent (d) Metallic
6. **A bond pair in covalent molecules usually has:**
(a) One electron (b) two electrons (c) Three electrons (d) Four electrons
7. **Which of the following compounds is not directional in its bonding?**
(a) C (b) KBr (c) CO₂ (d) H₂O
8. **Ice floats on water because:**
(a) Ice is denser than water (c) Water is denser than ice
(b) Ice is crystalline in nature (d) Water molecules move randomly
9. **Covalent bond involves the**
(a) Donation of electrons (b) acceptance of electrons
(c) Sharing of electrons (d) repulsion of electrons
10. **How many covalent bonds does C₂H₂ molecule have?**
(a) Two (b) Three (c) Four (d) Five
11. **Triple covalent bond involves how many number of electrons?**

- (a) Eight (b) Six (c) Four (d) Only three
12. Which pair of the molecules has same type of covalent bonds?
 (a) O₂ and HCl (b) O₂ and N₂ (c) O₂ and C₂ (d) O₂ and C₂H₂
13. Identify the compound which is not soluble in water.
 (a) C₆H₆ (b) NaCl (c) KBr (d) MgCl₂
14. Which one of the following is an electron deficient molecule?
 (a) NH₃ (b) BF₃ (c) N₂ (d) O₂
15. Identify which pair has polar covalent bonds.
 (a) O₂ and Cl₂ (b) H₂O and N₂ (c) H₂O and C₂H₂ (d) H₂O and HCl
16. Which one of the following is the weakest force among the atoms?
 (a) ionic force (b) metallic force (c) intermolecular force (d) covalent force

ANSWER KEY

1	c	4	d	7	a	10	c	13	b	16	b
2	c	5	b	8	b	11	c	14	d	17	d
3	c	6	b	9	b	12	d	15	a	18	c

Exercise Short Question Answers

Q.1 Why do atoms react?

Ans: Atoms react to form chemical bonds in order to get stability. Atoms achieve stability by attaining electronic configuration of inert gases by losing, gaining or sharing of electron.

Q.2 Why is the bond between an electropositive and an electronegative atom ionic in nature?

Ans: The bond between an electropositive and an electronegative atom is ionic in nature because electropositive atom due to low I.E. can lose electron easily and forms a positive ion whereas electronegative atom due to high electron affinity will accept that electron easily and forms a negative ion. In this way positive and negative ions are attracted by electrostatic force of attraction to form ionic bond.

Q.3 Ionic compounds are solids. Justify.

Ans: Ionic compounds are solids because they have strong electrostatic forces of attraction between positively and negatively charged ions which hold them in a three dimensional crystalline or solid form.

Example:

Potassium chloride (KCl) is a crystalline solid.

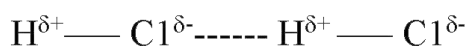
- d. There should be 4 or more valence electrons.
- e. The ionization energies of the elements must be high.

Example: HCl, Cl₂, C₆H₆ and C₂H₂

Q.10 Why HCl has dipole-dipole forces of attraction?

Ans: HCl forms a polar covalent bond atoms due to difference of electro negativity between bonded atoms. There exists a dipole in the molecule. The positive end of one molecule attracts the negative end of there molecule. Hence dipole force. (Intermolecular forces) exist between HCl molecules.

Example:



Q.11 What is a triple covalent bond, explain with an example?

Ans: When each bonded atom contributes three electrons, three bond pairs are involved in bond formation. This type of bond is called triple covalent bond.

Representation:

It is represented by (\equiv).

Example:

Triple covalent bond is formed in nitrogen molecule. In nitrogen molecule three bond pairs are involved in bond formation.



Q.12 What is difference between polar and non-polar covalent bonds, explain with one example of each?

Ans: Difference between polar and non polar covalent

Polar Covalent Bond	Non Polar Covalent Bond
<p>i. It is a bond formed between two different types of atoms (hetero atoms).</p> <p>ii. The shared pair of electrons is attracted by both the atoms un equally.</p> <p>Examples. HCl, HBr, HF, H₂O etc</p>	<p>i. It is a bond formed between two similar atoms (homo atoms).</p> <p>ii. The shared pair of electrons is attracted by both the atoms equally.</p> <p>Examples. H₂, Cl₂, N₂O₂ etc</p>

Q.13 Why a covalent bond becomes polar?

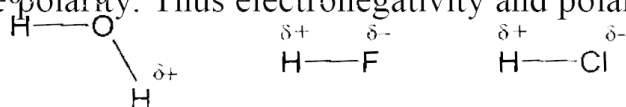
Ans: When there is a difference of electronegativity between two covalently bonded atoms, there will be unequal attraction for the bond pair of electrons between such atoms. It will result in the formation of polar covalent bond.

Examples: HCl, H₂O etc.

Q.14 What is relationship between electronegativity and polarity?

Ans: The polarity of a covalent bond depends upon the electronegativity difference between the bonded atoms. Higher the electronegativity difference between bonded atoms, greater will be the polarity. Thus electronegativity and polarity are directly related:

Examples:



Q.15 Why does ice float on water?

Ans: Ice floats on water because density of ice (0.917g/cm^3) is less than that of liquid water (1.00g/cm^3) at 0°C .

Q.16 Give the characteristic properties of ionic compounds.

Ans: Characteristics properties of ionic compounds.

- i. Ionic compounds are mostly crystalline solids.
- ii. Ionic compounds are good conductors in solution and in molten form due to presence of free ions in them.
- iii. Ionic compounds have high melting and boiling points. For example NaCl has melting point 800°C and boiling point 1413°C .
- iv. Ionic compounds dissolve in polar solvents e.g. NaCl dissolves in water.

Q.17 What characteristic properties do the covalent compounds have?

Ans: Characteristic properties of covalent compounds:

- i. **Melting boiling points:** They have usually low melting and boiling point.
- ii. **Electrical conductivity:** They are usually bad conductors of electricity. Polar compounds are conductors in their solutions in polar solvents.
- iii. **Solubility:** They are usually insoluble in water but soluble in non-aqueous solvents like benzene, ether, alcohol and acetone.
- iv. **Crystal formation:** Bigger molecules with three dimensional bonding form covalent crystals which are very stable and hard. They have high melting and boiling points.

Exercise Long Question Answers

Q.1 What is an ionic bond? Discuss the formation of ionic bond between sodium and chlorine atoms?

Ans: See Q. No. 4 (Subjective Part, Long Questions Answers)

Q.2 How can you justify that bond strength in polar covalent compounds is comparable to that of ionic compound?

Ans: See Q. No. 7 (Subjective Part, Long Questions Answers)

Q.3 What type of covalent bonds are formed between hydrogen, oxygen and nitrogen? Explain their bonding with dot and cross model.

Ans: See Q. No. 7 (Subjective Part, Long Questions Answers)

Q.4 How a covalent bond develops ionic character in it? Explain.

Ans:

Q.5 Explain the types of covalent bonds with at least one example of each type.

Ans: See Q. No. 5 (Subjective Part, Long Questions Answers)

Q.6 How a coordinate covalent bond is formed? Explain with examples?

Ans: See Q. No. 6 (Subjective Part, Long Questions Answers)

Q.7 What is metallic bonds? Explain the metallic bonding with the help of a diagram.

Ans: See Q. No. 8 (Subjective Part, Long Questions Answers)

Q.8 Define hydrogen bonding. Explain that how these forces affect the physical properties of compounds.

Ans: See Q. No. 9 (Subjective Part, Long Questions Answers)

Q.9 What are intermolecular forces? Compare these forces with chemical bond forces with reference to HCl molecule?

Ans:

Q.10 What is a chemical bond and why do atoms form a chemical bond?

Ans: See Q. No. 1 (Subjective Part, Long Questions Answers)

Q.11 What is octet rule? Why do atoms always struggle to attain nearest noble gas electronic configuration?

Ans: See Q. No. 2 (Subjective Part, Long Questions Answers)