
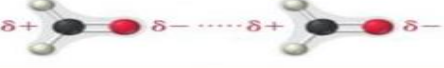




CHAPTER 9: States of Matter

Part 2: Forces of Attraction

Types of Intermolecular forces			
Type	Present in	Molecular prespective	Strength
Dispersion*	All molecules and atoms		0.05–20+ kJ/mol
Dipole–dipole	Polar molecules		3–20+ kJ/mol
Hydrogen bonding	Molecules containing H bonded to F, O, or N		10–40 kJ/mol
Ion–dipole	Mixtures of ionic compounds and polar compounds		30–100+ kJ/mol

- **Dispersion forces** are weak forces that result from temporary shifts in density of electrons in electron clouds.
- **Dipole-dipole forces** are attractions between oppositely charged regions of polar molecules.
- **Hydrogen bonds** are special dipole-dipole attractions that occur between molecules that contain a hydrogen atom bonded to a small, highly electronegative atom with at least one lone pair of electrons, typically fluorine, oxygen, or nitrogen

Q9 A hydrogen bond is a type of ____.

- CH** A Dispersion force
8 B Ionic bond
 C Covalent bond
 D Dipole-dipole force

Hydrogen bonds are special dipole-dipole attractions that occur between molecules that contain a hydrogen atom bonded to a small, highly electronegative atom with at least one lone pair of electrons, typically fluorine, oxygen, or nitrogen →D

Q10 Which of the following molecules can form hydrogen bonds?

- CH** A CO₂ B C₂H₆
8 C NH₃ D H₂

Hydrogen bonds occur between molecules that contain a hydrogen atom bonded to a small, highly electronegative atom with at least one lone pair of electrons, typically fluorine, oxygen, or nitrogen →C

Q11 Type of intermolecular forces between CO₂ molecule is

- CH** A Dispersion force
8 B Ionic bond
 C Covalent bond
 D Dipole-dipole force

CO₂ is non-polar molecule so dispersion forces →A

Q12 The strongest attractive forces between

- CH** A C₂H₂ B C₂H₆
8 C H₂O D H₂

Hydrogen bonds occur between H₂O molecules so its the strongest →C

Q13 The weakest attractive forces between

- CH** A HF B NH₃
8 C H₂O D H₂

Dispersion forces occur between H₂ molecules so its the weakest →D

Q14 Which of the following molecules can form dipole-dipole forces?

- CH** A Br₂ B C₃H₆
8 C HCl D F₂

Dipole-dipole forces are attractions between oppositely charged regions of polar molecules →C

Q15 Which of the following molecules can form Hydrogen bonds?

- CH** A CH₄ B NCl₃
8 C CH₃OH D CH₃F

Hydrogen bonds occur between molecules that contain a hydrogen atom bonded to a small, highly electronegative atom with at least one lone pair of electrons, typically fluorine, oxygen, or nitrogen →C

Q16 Type of intermolecular forces between C₂H₆ molecule is

- CH** A Dispersion force B Ionic bond
8 C Covalent bond D Dipole-dipole force
- Dispersion forces occur between non-polar molecules.no →A

Q17 The strongest attractive forces between

- CH** A CH₄ B C₂H₆
8 C C₃H₈ D C₄H₁₀

Dispersion forces will be more strong when Mass increased →D

1 The strongest attractive forces between

- Do** A CH₃OH B C₂H₅OH
It? C C₃H₇OH D C₄H₉OH

2 The weakest attractive forces between

- Do** A CH₃NH₂ B C₂H₅ NH₂
It? C C₃H₇ NH₂ D C₄H₉ NH₂

CHAPTER 8: States of Matter

Part 3: Liquids and Solids

Liquids:

- Forces of attraction keep molecules closely packed in a fixed volume, but not in a fixed position
 - Liquids are much denser than gases because of the stronger intermolecular forces holding the particles together.
 - Large amounts of pressure must be applied to compress liquids to very small amounts.
 - **Fluidity** is the ability to flow and diffuse; liquids and gases are fluids.
 - **Viscosity** is a measure of the resistance of a liquid to flow and is determined by the type of intermolecular forces, size and shape of particles, and temperature. **The stronger** the intermolecular attractive forces, the higher the viscosity. Larger molecules **create greater viscosity**. **Long chains** of molecules result in a higher viscosity: cooking oils and motor oils.
- Increasing the temperature** decreases viscosity because the added energy allows the molecules to overcome intermolecular forces and flow more freely.

Surface tension is the energy required to increase the surface area of a liquid by a given amount.

Surface tension is the a measure of the inwards pull by particles in the interior.

The stronger the attraction between particles the stronger the surface tension. Ex. Water

Cohesion is the force of attraction between identical molecules.

Adhesion is the force of attraction between molecules that are different.

Capillary action is the upward movement of liquid into a narrow cylinder, or capillary tube

Solids:

Solids contain particles with strong attractive intermolecular forces.

Particles in a solid vibrate in a fixed position.

Most solids are more dense than liquids.

One exception to this is water. Ice is less dense than liquid water. The hydrogen bonding in ice results in an open symmetrical structure that keeps the water molecules in ice farther apart than in water in a liquid state.

Crystalline solids are solids with atoms, ions, or molecules arranged in an orderly, geometric shape.

A unit cell is the smallest arrangement of atoms in a crystal lattice that has the same symmetry as the whole crystal.

Amorphous solids are solids in which the particles are not arranged in a regular, repeating pattern.

Q18 The smallest arrangement of atoms in a crystal that has the same pattern as the crystal is called ____.

- CH A Crystal lattice B Unit cell
8 C Crystalline D Geometric cell

A unit cell is the smallest arrangement of atoms in a crystal lattice that has the same symmetry as the whole crystal.

→B

Q19 Contain particles with strong attractive intermolecular forces.

- CH A Solids B Liquids
8 C Gases D Plasma

Solids contain particles with strong attractive intermolecular forces.

→A

Q20 Liquids are ... than gases because of the stronger intermolecular forces holding the particles together.

- CH A Less denser B Much denser
8 C weaker D Compressible

Liquids are much denser than gases because of the stronger intermolecular forces holding the particles together.

→B

Q21 The ability to flow and diffuse; liquids and gases are fluids.

- CH A Cohesion B Fluidity
8 C Surface tension D Viscosity

Fluidity is the ability to flow and diffuse; liquids and gases are fluids.

→B

Q22 A measure of the inwards pull by particles in the interior.

- CH A Cohesion B Fluidity
8 C Surface tension D Viscosity

Surface tension is the a measure of the inwards pull by particles in the interior.

→C

Q23 The measure of the resistance of a liquid to flow and is determined by the type of intermolecular forces, size and shape of particles, and temperature

- CH A Cohesion B Fluidity
8 C Surface tension D Viscosity

Viscosity is a measure of the resistance of a liquid to flow and is determined by the type of intermolecular forces, size and shape of particles, and temperature.

→D

Q24 The force of attraction between identical molecules.

- CH A Cohesion B Fluidity
8 C Surface tension D Viscosity

Cohesion is the force of attraction between identical molecules.

→A

Q25 ... are solids with atoms, ions, or molecules arranged in an orderly, geometric shape.

- CH A Negative solids B Crystalline solids
8 C Positive solids D Amorphous solids

Crystalline solids are solids with atoms, ions, or molecules arranged in an orderly, geometric shape.

→B

26 The smallest arrangement of atoms in a crystal lattice that has the same symmetry as the whole crystal.

- CH A Cohesion B Unit cell
8 C Surface tension D Viscosity

A unit cell is the smallest arrangement of atoms in a crystal lattice that has the same symmetry as the whole crystal.

→B

D

A