

- In substances that sublime, the intermolecular forces of attraction are
 - weak and the vapor pressure is low
 - weak and the vapor pressure is high
 - strong and the vapor pressure is low
 - strong and the vapor pressure is high
- Argon has a higher boiling point than neon because argon has
 - fewer electrons in its 2nd principal energy level
 - more electrons in its outermost principal energy level
 - weaker intermolecular forces of attraction
 - stronger intermolecular forces of attraction
- The abnormally high boiling point of HF as compared to HCl is primarily due to intermolecular forces of attraction called
 - network bonds
 - electrovalent forces
 - van der Waals forces
 - hydrogen bonds
- Based on Reference Table H, which substance has the weakest intermolecular forces?
 - ethanoic acid
 - ethanol
 - propanone
 - water
- Which of these substances has the strongest intermolecular forces?
 - H₂O
 - H₂S
 - H₂Se
 - H₂Te
- Based on intermolecular forces, which of these substances would have the highest boiling point?
 - He
 - O₂
 - CH₄
 - NH₃
- At 50.°C and standard pressure, intermolecular forces of attraction are strongest in a sample of
 - ethanoic acid
 - ethanol
 - propanone
 - water

** Table H*
- The atoms in a molecule of hydrogen chloride are held together by
 - ionic bonds
 - polar covalent bonds
 - van der Waals forces
 - dipole-dipole attraction

- Which type of attraction occurs between nonpolar covalent molecules?
 - hydrogen bonding
 - van der Waals forces *AKA dispersion*
 - ion-ion attraction
 - molecule-ion attraction

- The table below shows four compounds and the boiling point of each.

Compound	Boiling Point
H ₂ O	100.°C
H ₂ S	-60.7°C
H ₂ Se	-41.5°C
H ₂ Te	-2.2°C

Which type of molecular attraction accounts for the high boiling point of H₂O?

- molecule-ion
 - ion-ion
 - hydrogen bonding
 - van der Waals forces
- Which formula represents a polar molecule?
 - O₂
 - CO₂
 - NH₃
 - CCl₄
 - Which formula represents a Bent molecule?
 - CH₄
 - CaCl₂
 - NH₃
 - H₂O
 - Which formula has an asymmetrical charge distribution?
 - O₂
 - CO₂
 - PF₃
 - CH₄
 - Which statement describes the charge distribution and the polarity of a CH₄ molecule?
 - The charge distribution is symmetrical and the molecule is nonpolar.
 - The charge distribution is asymmetrical and the molecule is nonpolar.
 - The charge distribution is symmetrical and the molecule is polar.
 - The charge distribution is asymmetrical and the molecule is polar.
 - Which is the formula of a nonpolar molecule containing nonpolar bonds?
 - CO₂
 - H₂
 - NH₃
 - H₂O

Molecular Polarity

16. Base your answer to the following question on the information below.

Molar Mass and Boiling Point of Four Substances

Substance	Molar Mass (g/mol)	Boiling Point at 1 atm (K)
methane	16	112
ethane	30	185
propane	44	231
butane	58	273

State, in terms of intermolecular forces, why the boiling point of propane at 1 atmosphere is *lower* than the boiling point of butane at 1 atmosphere.

Propane has a lower B.P. b/c it has weaker IMFs

17. Which molecule is nonpolar?

- 1) H₂O 2) NH₃ 3) CO 4) CO₂

Molecular Polarity

18. Base your answer to the following question on the information below.

Carbon forms molecular compounds with some elements from Group 16. Two of these compounds are carbon dioxide, CO_2 , and carbon disulfide, CS_2 .

Carbon dioxide is a colorless, odorless gas at room temperature. At standard temperature and pressure, $\text{CO}_2(\text{s})$ changes directly to $\text{CO}_2(\text{g})$.

Carbon disulfide is formed by a direct reaction of carbon and sulfur. At room temperature, CS_2 is a colorless liquid with an offensive odor. Carbon disulfide vapors are flammable.

Compare the intermolecular forces in CO_2 and CS_2 at room temperature.

CO_2 has weaker IMFs at Room temp b/c it's a gas
and CS_2 is a liquid at Room temp

19. Base your answer to the following question on the information below and on your knowledge of chemistry.

As plants grow, light energy is converted into chemical energy during the process of photosynthesis. The reaction produces glucose and oxygen. The balanced equation below represents photosynthesis.



State the molecular polarity for each of the reactants in the equation.

$\text{CO}_2 = \text{Non Polar}$ $\text{H}_2\text{O} = \text{Polar}$

20. Base your answer to the following question on the information below.

Some Properties of Three Compounds at Standard Pressure

Compound	Boiling Point (°C)	Solubility in 100. Grams of H_2O at 20.°C (g)
ammonia	-33.2	56
methane	-161.5	0.002
hydrogen chloride	-84.9	72

Explain, in terms of molecular polarity, why hydrogen chloride is more soluble than methane in water at 20.°C and standard pressure.

HCl is more soluble in H_2O

b/c both $\text{HCl} + \text{H}_2\text{O}$ are Polar $\frac{1}{2}$ Likes dissolve Likes

Since CH_4 (methane) doesn't ~~do~~

dissolve in H_2O very well, its polarity

is different than H_2O (Polar). \therefore Methane must be Nonpolar