Name: Lito J. Libradilla	**Yr. & Sec.:** Grade 12 – STEM Asclepius
Subject Code: STEM08	**Subject Title**: General Chemistry 2
Module No: 2	**Topic**: Intermolecular Forces of Attraction

IV. WE'RE ON OUR WAY

Quiz 2.1 IDENTIFICATION (15 POINTS)

Directions: Identify the type of intermolecular force will act in the following substances/ solution. Justify your answer.

1. carbon dioxide (CO2)

- CO2 is a nonpolar molecule because the two oxygen atoms pull the electrons in the carbon-oxygen bonds with equal strength.
- The dominant intermolecular force in nonpolar molecules is van der Waals forces, specifically London dispersion forces.
- Justification: London dispersion forces are the only significant forces acting between nonpolar molecules, and since CO2 is nonpolar, London dispersion forces are the intermolecular forces present.

2. neon (Ne) gas

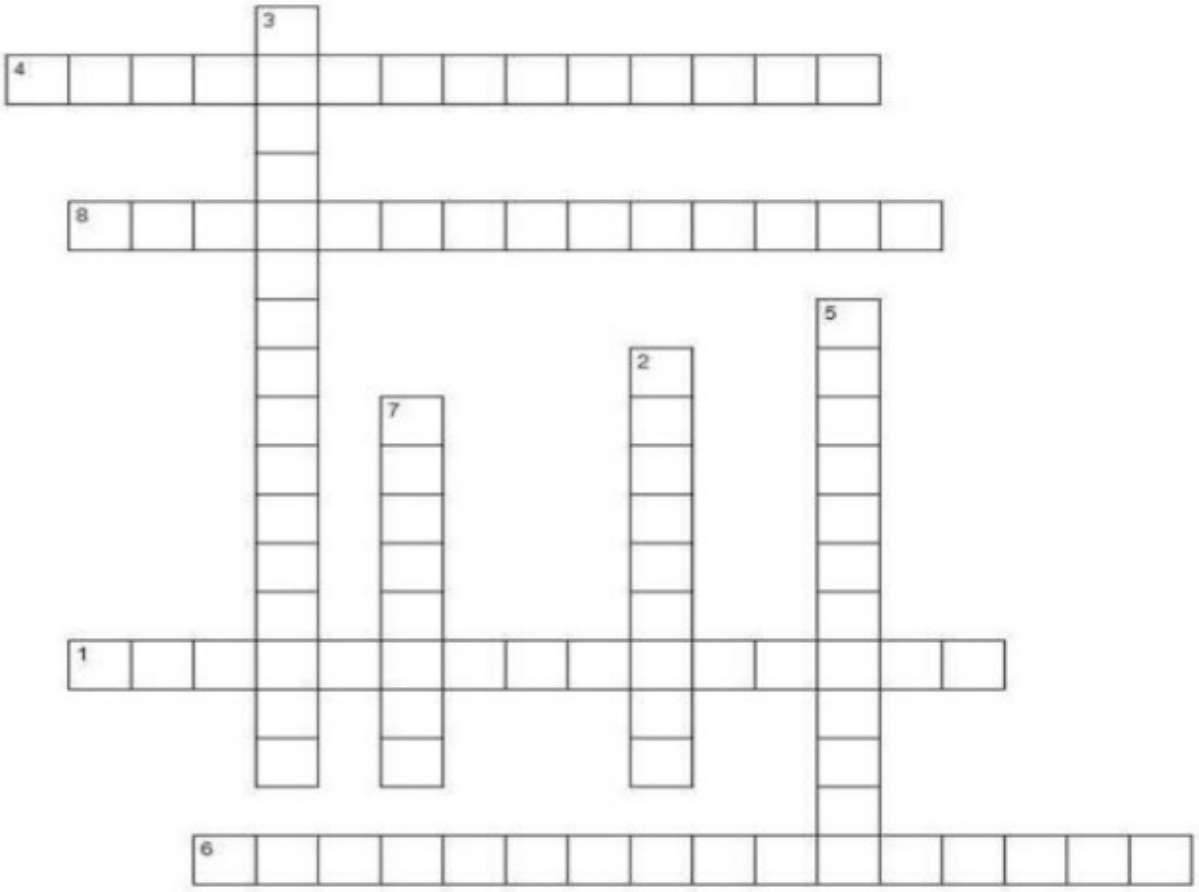
- Neon is a noble gas and exists as individual atoms, not molecules.
- Noble gases are monatomic, meaning they exist as single atoms without any sharing or transfer of electrons.
- The primary intermolecular force acting on noble gases is van der Waals forces, specifically London dispersion forces.
- Justification: Similar to CO2, neon experiences London dispersion forces as it is a noble gas composed of individual atoms.

3. magnesium chloride (MgCl2) dissolved in water

- MgCl2 is an ionic compound, and when dissolved in water, it dissociates into ions (Mg2+ and 2Cl-).
- The dominant intermolecular forces in ionic compounds dissolved in water are ion-dipole interactions between the ions and the water molecules.
- Justification: In the case of MgCl2 dissolved in water, ion-dipole interactions occur between the positively charged Mg2+ ions and the negatively charged Cl- ions with the partially charged dipoles of water molecules.

HOW FAR HAVE WE GONE?

Activity 4: Operation Crossword Puzzle Directions: Complete the crossword by filling in the boxes to form a word that fits each clue. Disregard space between two-word phrases or hyphens.



Across:
1. This is a special case of a very strong dipole-dipole interaction.
4. The force that holds atoms together in a molecule.
6. Intermolecular forces present among symmetrical nonpolar substances.
8. The attractive force between molecules.

Down:
2. This is an intermolecular force that acts between an ion and a polar molecule.
3. A collective term used to define the attraction of intermolecular forces.
5. These are attractive forces between polar molecules.
7. The atom of this element forms hydrogen bonding.

VI. WALKING THE EXTRA MILES (PERFORMANCE CHECK)

Performance Check: What if? (20 POINTS)

Directions: Investigate and analyze the given situation. Provide a detailed explanation for each case. Water is present in almost every living things, including human beings. It was discussed that water molecules are held by Hydrogen bonds. What do you think will happen if Hydrogen bonding in water does not exist at all?

Answer:

If hydrogen bonding in water does not exist at all, it would have profound effects on the physical and chemical properties of water, as well as on the structure and function of living organisms. Hydrogen bonding is a unique and essential property of water that plays a crucial role in various aspects of biology and chemistry. Here are some consequences if hydrogen bonding in water were absent:

1) Physical Properties:
    - **Boiling and Melting Points:** Hydrogen bonding is responsible for the unusually high boiling and melting points of water compared to other compounds of similar molecular weight. If hydrogen bonding were absent, water would have significantly lower boiling and melting points, making it transition between states more easily.
    - **Density:** Hydrogen bonding contributes to the unusual density behavior of water. Water reaches its maximum density at 4 degrees Celsius due to the arrangement of hydrogen-bonded molecules. Without hydrogen bonding, water would have a more typical density behavior, and ice would not float on water.
2) Chemical Properties:
    - **Solvent Properties:** Water's ability to dissolve a wide variety of substances is attributed to its polar nature and the formation of hydrogen bonds with solute molecules. Without hydrogen bonding, water's solvent properties would be reduced, limiting its ability to dissolve certain ionic and polar substances.
    - **Cohesion and Adhesion:** Hydrogen bonding is responsible for the high cohesion and adhesion properties of water molecules. Water forms droplets, and it can move against gravity in plants due to these properties. Without hydrogen bonding, water would be less cohesive and adhesive, affecting its behavior in biological systems.

3) Biological Implications:
    - **Protein Structure:** Hydrogen bonds play a crucial role in maintaining the three-dimensional structure of proteins. The absence of hydrogen bonding in water would affect the stability of protein structures, potentially leading to denaturation and loss of function.
    - **DNA Structure:** The double helical structure of DNA is stabilized by hydrogen bonds between complementary base pairs. Without hydrogen bonding, the stability of the DNA structure would be compromised, affecting the storage and transmission of genetic information.
    - **Cell Membrane Properties:** Hydrogen bonding contributes to the structure and properties of cell membranes. Changes in water's hydrogen bonding capabilities would impact the fluidity and permeability of cell membranes, affecting cellular processes.

In summary, if hydrogen bonding in water did not exist, it would lead to significant alterations in the physical and chemical properties of water, with far-reaching consequences for biological systems and the environment. Life as we know it depends on the unique properties of water, and the absence of hydrogen bonding would have profound implications for the structure and function of living organisms.