

38.1 Inter-molecular Forces & Phase Changes



Summarize main points from each video.

Video Title / topic _____

Video Title / topic _____

Video Title / topic _____

Topic Introduction



Summarize your understanding of each paragraph.

There are two kinds of forces, or attractions, that operate in a molecule—intramolecular and intermolecular. This topic explores the relationship of intermolecular forces and phase changes. That is, changes from gas to liquid to solid.

For the purposes of this topic, the best way to picture the “solid state” of a substance is to imagine closely packed, highly ordered particles. This would be in contrast to the widely spaced, randomly arranged particles of a gas. Of course, liquid state lies in between.

Intermolecular forces are much weaker than the intramolecular forces of attraction. Even so, intermolecular forces are important because they determine the physical properties of molecules. Examples of physical properties include boiling point & density.

There are four types of intermolecular forces: Metallic, Ionic, Polar Covalent, and Non-Polar Covalent bonds. Each of these types are useful in describing and predicting relationships and interactions of substances.

Read/Summarize Text



1. Read the passage.
2. Underline key expressions in each sentence.
3. Re-write each word (or expression) you underlined.
4. Summarize the passage.

Contrast of Intra- and Inter-molecular Forces.

Intermolecular forces (IMF) are the forces which mediate interaction between molecules, including forces of attraction or repulsion which act between molecules and other types of neighboring particles – such as atoms or ions. While most substances consisting of small molecules are gases at normal temperatures and pressures, water is a liquid. The reason for this has to do with intermolecular forces – those forces which exist between the molecules.

NOTE: intramolecular forces are forces inside the molecules, holding them together – whereas intermolecular forces are between molecules.

Honeycutt Science chemistry online textbook.

Re-write words you underlined

Using a complete sentence, summarize or rephrase the passage

Read and Examine Diagram

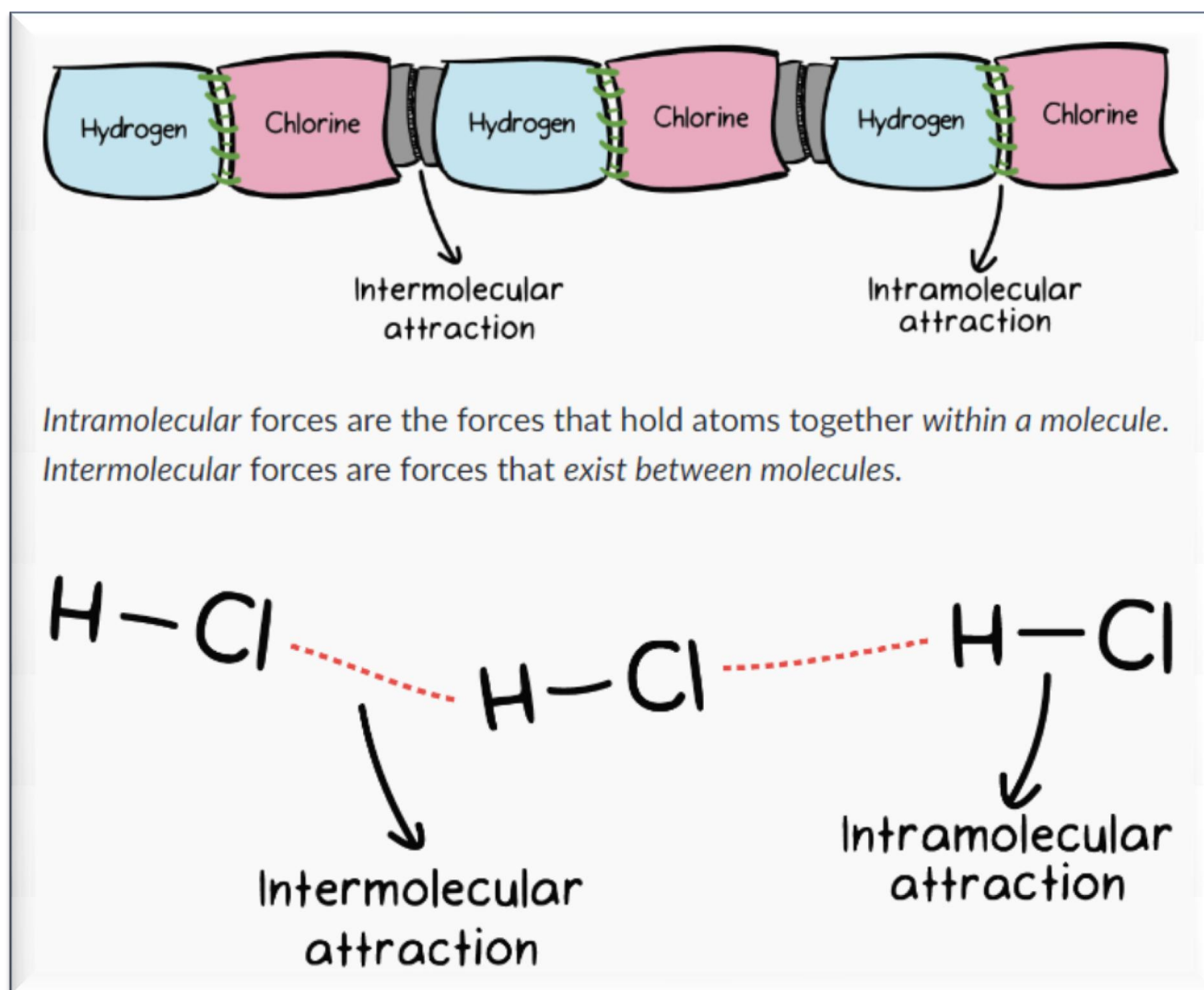
Read this extract – along with the associated diagram.

Compare what you already know with this content presented.

DECIDE if YOU AGREE WITH THIS INFORMATION. DEFEND YOUR POSITION.

Here is an illustration of HCl . Hydrochloric acid is a colorless inorganic chemical system with the formula $\text{H}_2\text{O}:\text{HCl}$. Note that water is not included in the illustration (it is intentionally omitted to better depict the ideas in this topic). (Adapted from Wikipedia)

Hydrochloric acid is the simplest chlorine-based acid system containing water.



I don't understand how HCl is not a ionic bond.

Is this right?

Q. Hydrogen has one valence electron, Chlorine has 7. Chlorine only needs one to become stable, and hydrogen wants to get rid of its only one. When they come in contact, shouldn't they react and form HCl, but held together by ionic bonds?

A For simple explanation, first of all ionic bond only formed between metal and non-metal. But both Cl and H are non-metal. So actually HCl forms polar covalent bond. Cl is large and has very high electronegativity compared to H. Thus the electron cloud tends to move towards Cl. That's why it is polar.

Adapted from <https://www.physicsforums.com>

Copy the Table



Copy the table in space provided.

Intramolecular force	Basis of formation	Relative strength
Metallic bond	Metal cations to delocalized electrons	1, strongest
Ionic bond	Cations to anions	2
Polar covalent bond	Partially charged cation to partially charged anion	3
Nonpolar covalent bond	Nuclei to shared electrons	4, weakest

<https://www.khanacademy.org/test-prep/mcat/chemical-processes>

Copy table here.

Interpret a Graph



Write the title of the graph _____

Circle the type of chart this represents

Bar Chart Line Chart Pie Chart Other

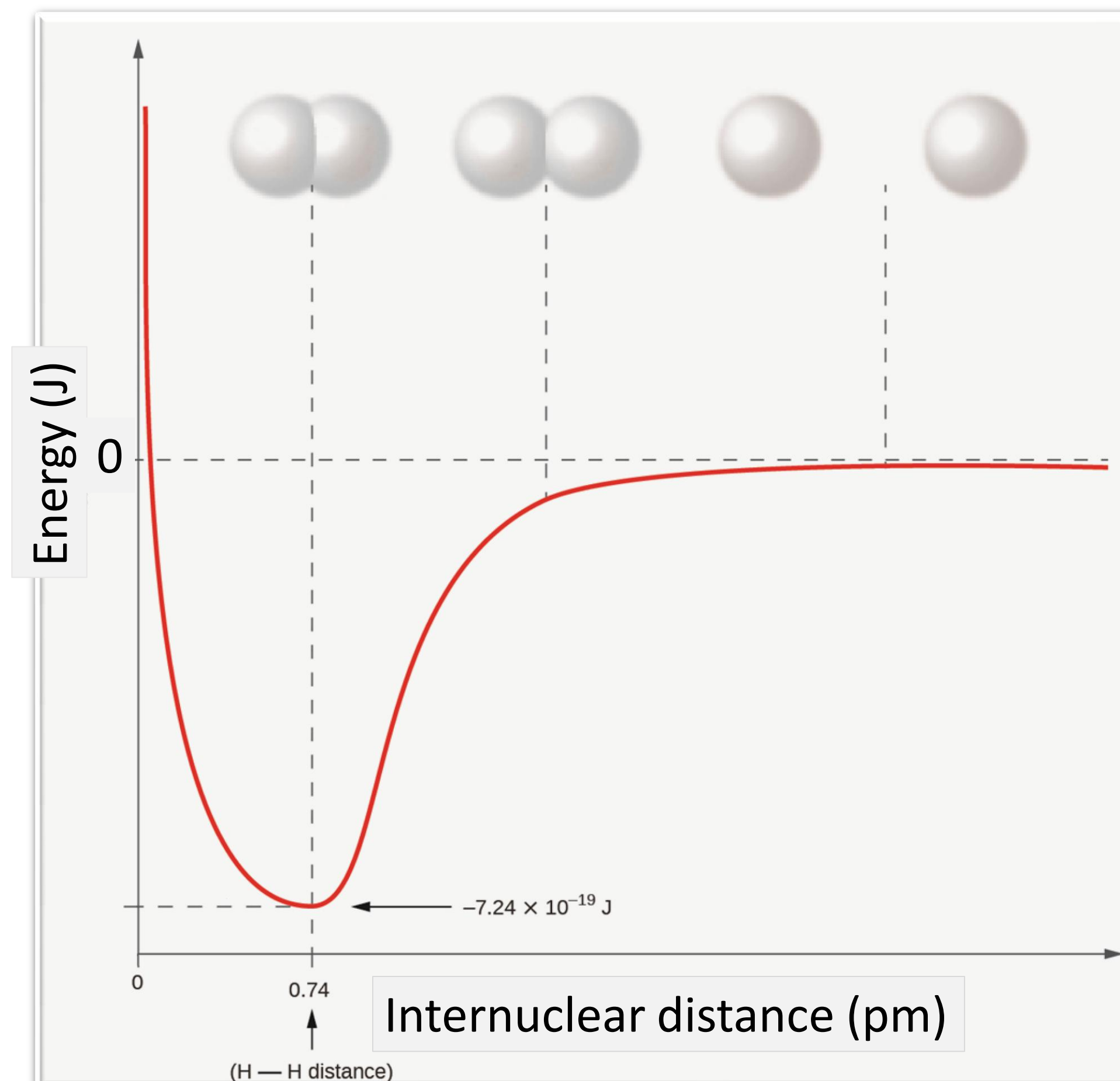
If applicable,

What does the X-axis represent _____

What does the Y-axis imply _____

Summarize what this graph represents or conveys

<https://opentextbc.ca/chemistry/chapter/7-2-covalent-bonding/>



Show-Off Your Smarts!



Instructions

- Complete as an individual or small group.
- Prepare to present your responses to the class.

Q1. *The equilibrium pressure of vapor over a liquid in a closed container is called the vapor pressure.*

Why does this label (*vapor pressure*) make sense in this situation?

Q2. *The boiling point of a liquid occurs at a temperature at which the vapor pressure of the liquid equals the atmospheric pressure.*

In your best judgment, how does this apply to evaporation over the oceans?

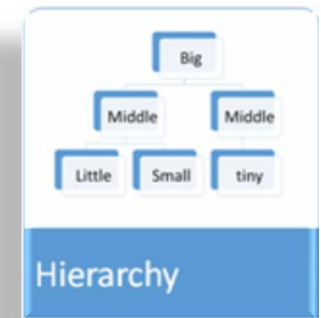
Q3. *The normal melting point (of a solid) and normal boiling point (of a liquid) are a pressure of 1 atm.*

Why are these called “the normal points?”

Complete a Hierarchy and Venn

Based on the information provided, draw a hierarchy diagram depicting this information.

Hierarchy



Types of solids include:

- Ionic solid – the components are ions
- Molecular solid – the components are molecules
- Atomic solid – the components are atoms

Hierarchy

Blank area for drawing a hierarchy diagram.

Venn

