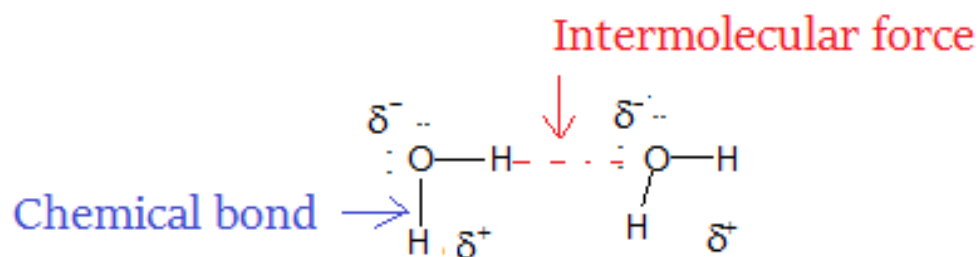


Intermolecular-Force Metaphor Extra-Credit (5 Points)



Intermolecular forces are attractive and repulsive forces which transpire among particles (molecules, ions, atoms, etc.) in a sample of matter (Silberberg, 2009, p. G-9). These forces are responsible for physical properties of matter, such as boiling point, melting point, vapor pressure, surface tension, and viscosity. At the conclusion of this assignment, the student is expected to:

- Articulate the difference between chemical bonds and intermolecular forces.
- Explain energy differences between chemical bonds and intermolecular forces.
- Generate a visual metaphor which embodies the differences between chemical bonds and intermolecular forces.

The following table is provided as a reference. For the relative strengths of chemical bonds versus intermolecular forces.

Force	Model	Basis of Attraction	Energy (kJ/mol)	Example
Bonding				
Ionic		Cation–anion	400–4000	NaCl
Covalent		Nuclei–shared e [−] pair	150–1100	H–H
Metallic		Cations–delocalized electrons	75–1000	Fe
Nonbonding (Intermolecular)				
Ion-dipole		Ion charge–dipole charge	40–600	Na ⁺ ·····O(H) ₂
H bond		Polar bond to H–dipole charge (high EN of N, O, F)	10–40	:O(H)–H·····:O(H)–H
Dipole-dipole		Dipole charges	5–25	I–Cl·····I–Cl
Ion-induced dipole		Ion charge–polarizable e [−] cloud	3–15	Fe ²⁺ ·····O ₂
Dipole-induced dipole		Dipole charge–polarizable e [−] cloud	2–10	H–Cl·····Cl–Cl
Dispersion (London)		Polarizable e [−] clouds	0.05–40	F–F·····F–F

(Silberberg, 2009, p. 431)

Intermolecular-Force Metaphor Extra-Credit (5 Points)

Directions: Identify a metaphor, complete with a visual, which distinguishes between chemical bonds and intermolecular forces. The rubric, along with an example for this assignment, is provided below:

Performance Objective	Point(s)
Included visual to accompany metaphor	1
Metaphor includes two or more major components which are held together via relatively strong forces.	1
Metaphor includes some physical, attractive force between the major components which is weaker than the force holding the major components intact.	1
Included one-paragraph explanation providing explanation of how metaphor satisfies first three rubric criteria	1
Worked in team of five or more individuals	1
Total:	5

Example: A fabric quilt.



(Tuesday tutorials, n.d.)

As the above diagram illustrates, a quilt is comprised of multiple pieces of colored fabric stitched together with thread. The pieces of fabric represent the molecules, which are held together by the tightly woven threads which keep the fabric intact. The thread used to stitch together the fabric pieces represents the intermolecular forces holding individual molecules together. Because it is generally easier to tear the thread holding fabric pieces together (intermolecular forces) than it is to rip a single piece of fabric in half, this metaphor illustrates the relative energy (strength) differences between chemical bonds and intermolecular forces.

References

Silberberg, M. S. (2009). Chemistry: the molecular nature of matter and change (6th ed.). New York, NY: McGraw-Hill.

Tuesday Tutorials: How to Sew a Quilt by Hand. (n.d.). Retrieved April 17, 2017, from <http://www.mccallsquilting.com/blogs/blog/2015/05/05/tuesday-tutorials-how-to-sew-a-quilt-by-hand/>