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| **Ion-Ion** |
| Same as an Ionic Bond |
| Melting KCl breaks these |
| Dissolving KCl breaks these |
| Freezing (solidifying) NaCl makes these |
| Strength of attraction depends upon the charge and, then, the size of the ion (Smaller is stronger!) |
| The only IMF that IS a BOND. |
| 600 – 4,000 kJ/mol released when formed |

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| **Ion-dipole** |
| When a salt dissolves in water, these are formed |
| Strength of attraction depends upon the charge and, then, size of the ion (Smaller is stronger!) and how polar the molecule is |
| These exist in a hydrate such as CuSO45 H2O |
| 40 – 600 kJ/mol are released when formed |
| an ion attracted to a polar molecule |

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| **Dipole-dipole** |
|  Strength of attraction depends on how polar both molecules are |
| Polar molecule attracted to a polar molecule |
| Hydrogen chloride gas particles stick together with this IMF |
| When acetonitrile (Image result for image CH3CN) condenses, these are formed |
| 5 – 25 kJ/mol are released when formed |

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| **Hydrogen bonding** |
| When an H bonded to F, O, N is ***attracted*** to an F, O, or N in a polar bond |
| 10 – 40 kJ/mol are released when formed |
| When water freezes, these are formed |
| When ethanol boils, these are broken |
| When ethanol dissolves in water, these are formed |
| Formed when ammonia is dissolved in water to make ammonia cleaner |
| The strongest type of dipole-dipole IMFs |

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| **Dipole-Induced Dipole** |
| When iodine dissolves in ethanol, these are formed |
| Strength of attraction depends upon how polar one molecule is and how polarizable the nonpolar molecule is |
| Formed when oxygen gas is dissolved in water |
| Formed when carbon dioxide is dissolved in water to make a carbonated beverage |
| Forms when a polar molecule induces a temporary polarity on a nonpolar molecule |
| 2 – 10 kJ/mol are released when formed |
| Polar molecule attracted to nonpolar molecule |

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| **Induced dipole – Induced dipole** |
| When iodine sublimes, these are broken |
| When iodine deposits, these are formed |
| Strength of attraction depends upon polarizability |
| Strength of attraction depends upon size of the nonpolar particle (Bigger is better!) |
| Responsible for allowing a gecko to walk up a wall – defying gravity! |
| Broken when dry ice sublimes |
| Formed when oxygen gas is liquefied |
| Also called van der Waals force |
| Also called dispersion force |
| Also called London force |
| 0.05- 40 kJ/mol are released when formed |
| The only significant force between a nonpolar molecule attracted to a nonpolar molecule |
| Found between any 2 attracted particles |
| Attraction created when the random motion of electrons in one atom or molecule induces a temporary dipole in a neighboring atom or molecule |
| Strength of attraction depends on how polarizable both molecules/atoms are.  |