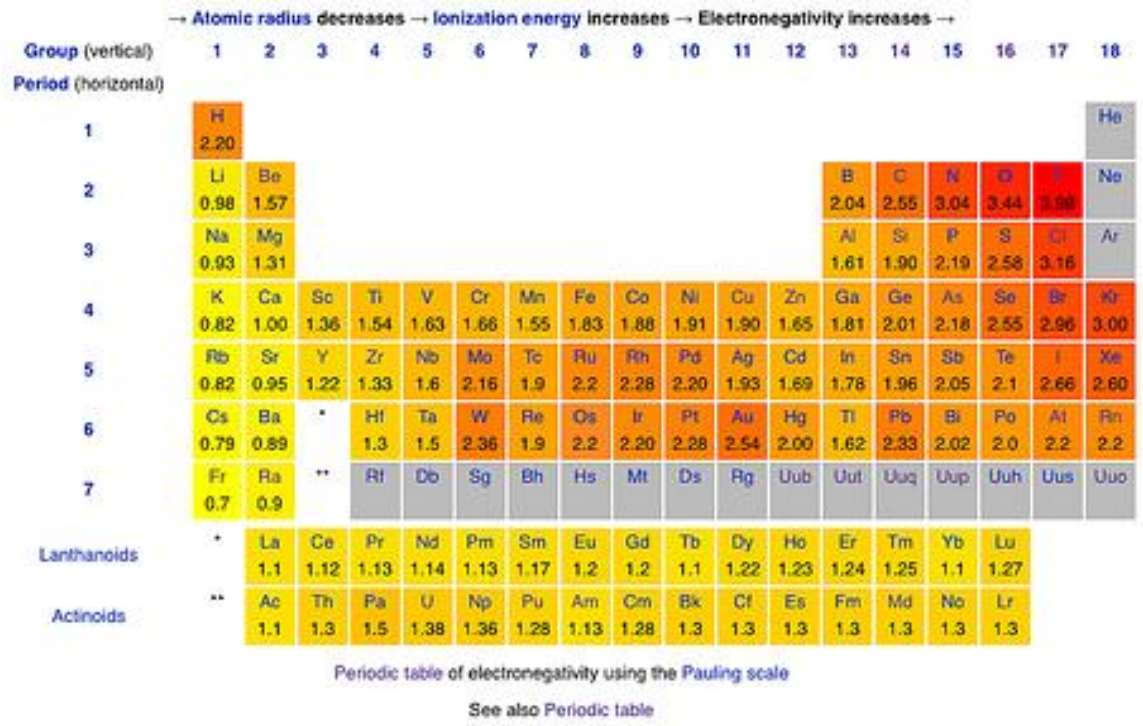
Polar, Non-Polar & Hydrogen Bonds

Packet #20

Polar Bond

Types of Chemical Bonds

Remember…



→ Atomic radius decreases → Ionization energy increases → Electronegativity increases →

Group (vertical)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period (horizontal)																		
1	H 2.20																	He
2	Li 0.98	Be 1.57											B 2.04	C 2.55	N 3.04	O 3.44	F 3.98	Ne
3	Na 0.93	Mg 1.31											Al 1.61	Si 1.90	P 2.19	S 2.58	Cl 3.16	Ar
4	K 0.82	Ca 1.00	Sc 1.36	Ti 1.54	V 1.63	Cr 1.66	Mn 1.55	Fe 1.83	Co 1.88	Ni 1.91	Cu 1.90	Zn 1.65	Ga 1.81	Ge 2.01	As 2.18	Se 2.55	Br 2.96	Kr 3.00
5	Rb 0.82	Sr 0.95	Y 1.22	Zr 1.33	Nb 1.6	Mo 2.16	Tc 1.9	Ru 2.2	Rh 2.28	Pd 2.20	Ag 1.93	Cd 1.69	In 1.78	Sn 1.96	Sb 2.05	Te 2.1	I 2.66	Xe 2.60
6	Cs 0.79	Ba 0.89	*	Hf 1.3	Ta 1.5	W 2.36	Re 1.9	Os 2.2	Ir 2.20	Pt 2.28	Au 2.54	Hg 2.00	Tl 1.62	Pb 2.33	Bi 2.02	Po 2.0	At 2.2	Rn 2.2
7	Fr 0.7	Ra 0.9	**	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Uub	Uut	Uuq	Uup	Uuh	Uus	Uuo
Lanthanoids	*	La 1.1	Ce 1.12	Pr 1.13	Nd 1.14	Pm 1.13	Sm 1.17	Eu 1.2	Gd 1.2	Tb 1.1	Dy 1.22	Ho 1.23	Er 1.24	Tm 1.25	Yb 1.1	Lu 1.27		
Actinoids	**	Ac 1.1	Th 1.3	Pa 1.5	U 1.38	Np 1.36	Pu 1.28	Am 1.13	Cm 1.28	Bk 1.3	Cf 1.3	Es 1.3	Fm 1.3	Md 1.3	No 1.3	Lr 1.3		

Periodic table of electronegativity using the Pauling scale

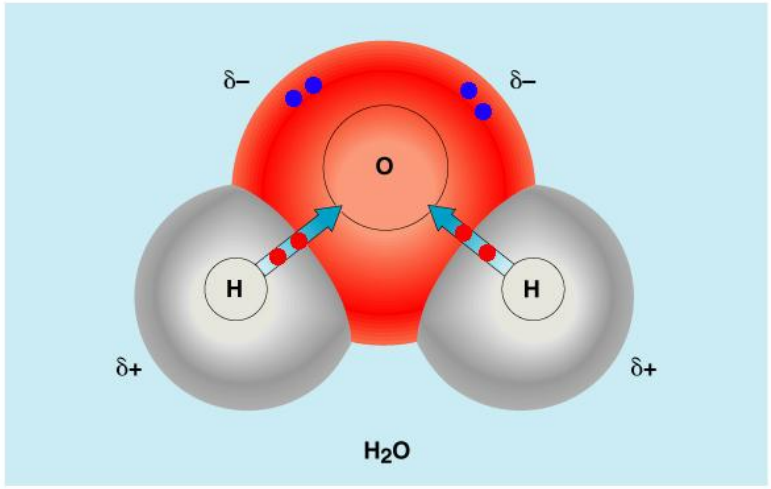
See also Periodic table

Bond Polarity & Chemical Bonds

* **Bond Polarity** is due to **differences in electro-negativity**
  * Bond polarity can predict the polarity of a bond
    * **ΔEN < 0.4 = non-polar covalent**
    * **ΔEN between 0.4 and 2.0 = polar covalent**
    * **ΔEN > 2.0 = ionic**
    * δ used to indicate partial charges
  * **Dipole movement** is the **measure of a molecule's overall polarity**
    * μ = Q (charge) * r (distance)
* More details to come in Organic Chemistry

Polar Bond

* A **polar bond** is formed because **one atom**, of the compound, **being more electronegative grabs more electron density from another atom**.
  * The electronegative atom attempts to steal electrons.



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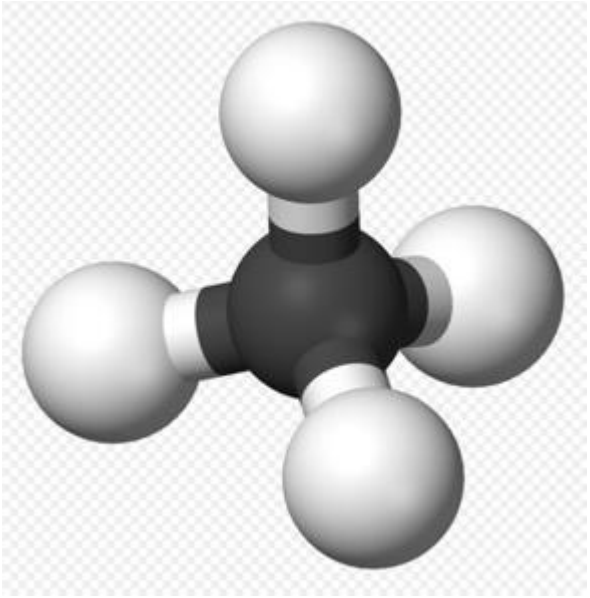
Non-Polar Bonds

Types of Chemical Bonds

Non-Polar Bond

* Joining of atoms with the same electronegativity

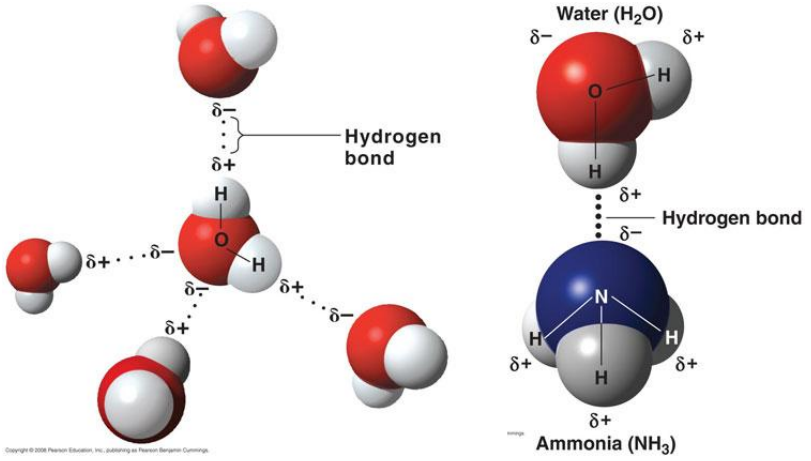


Hydrogen Bonds

Types of Chemical Bonds

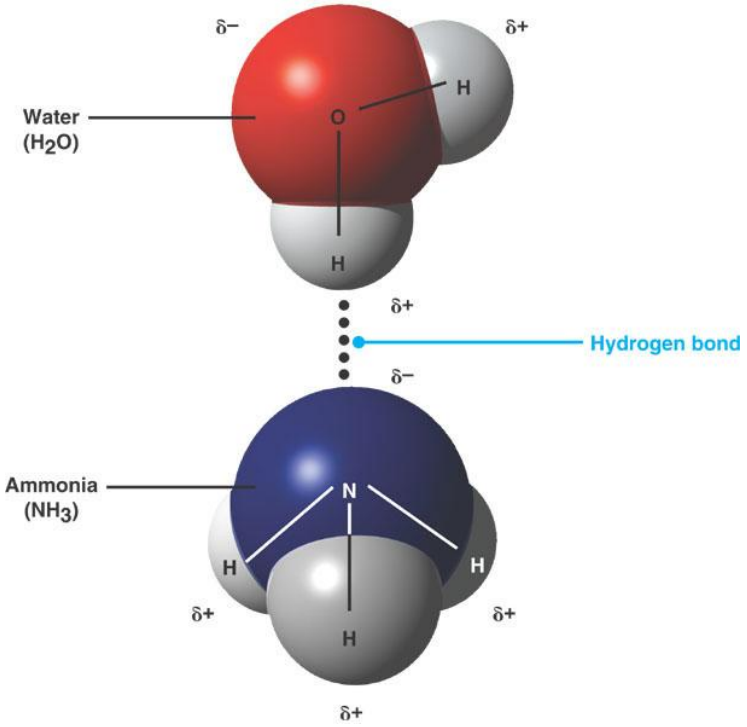
Hydrogen Bonds

* A strong **non-bonding interaction** that causes a quick, weak "chemical bond."
  * Occurs when **a hydrogen atom**, **attached** to **a highly electronegative atom**, interacts with a lone electron from a nearby electronegative atom.
* These bonds are broken almost immediately
  * Depends on temperature.



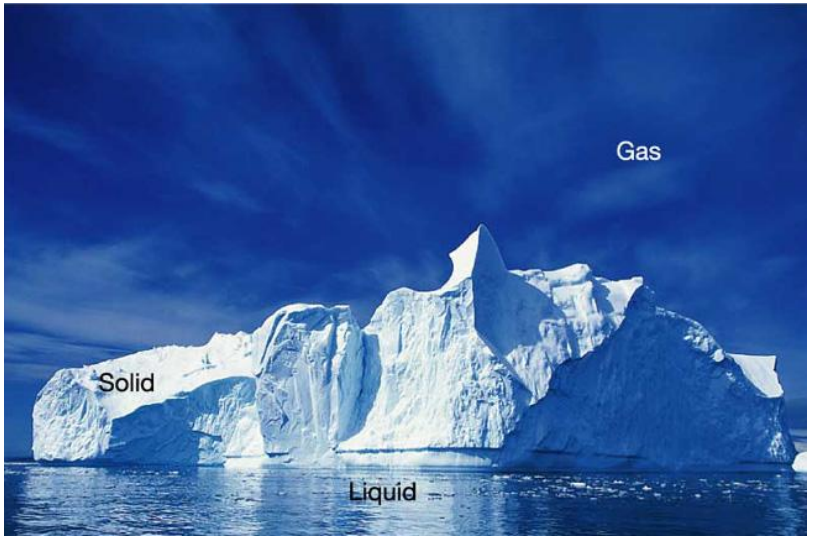
Hydrogen Bond

* Although hydrogen bonds are weak, the vast number of them in large molecules makes them collectively significant
  * The formation of water in various forms.

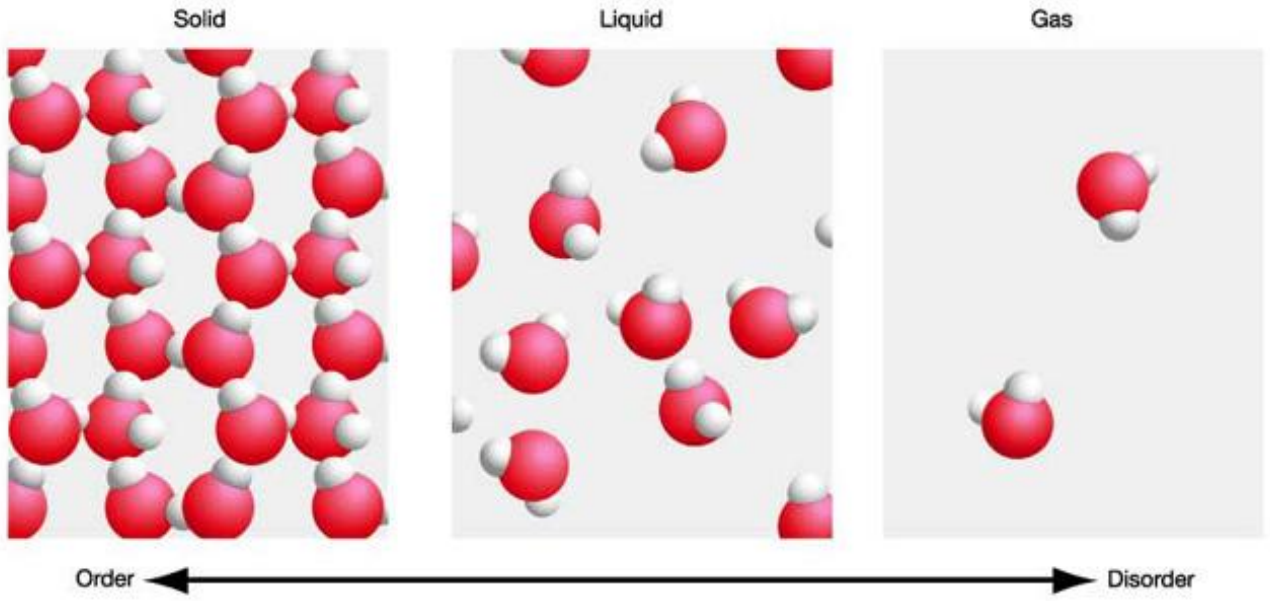


Phases of Matter

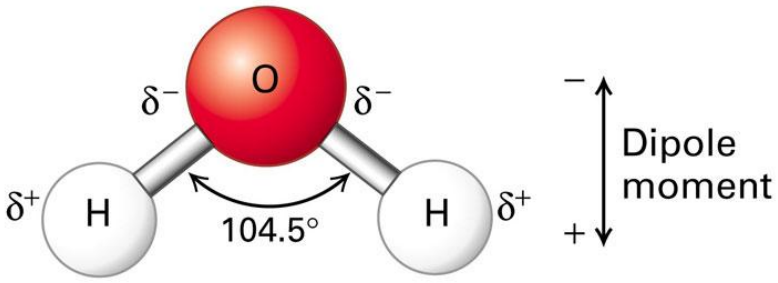
* Liquid
* Solid
* Gas
  * Elements and molecules can exist in all three phases

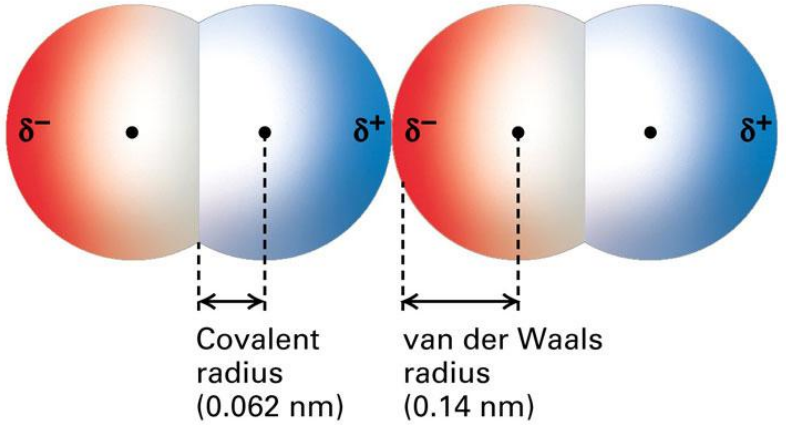


Phases of Matter II



Van der Waals Forces





Review