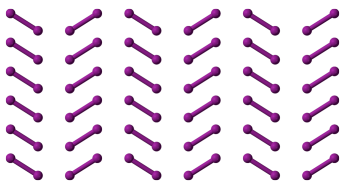
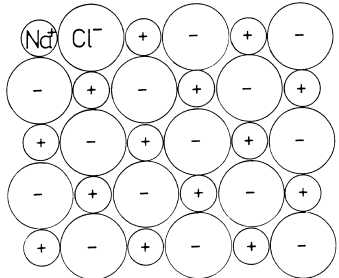
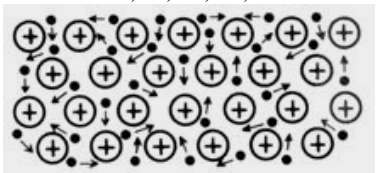


Matter can be classified by the type of constituent particles present and the forces that hold them together in a crystalline solid state.

Substance type	Structural units	Attractive forces between structural units	Physical properties	Examples
Molecular	Molecules (covalently bonded groups of atoms)	Intermolecular forces (IMFs): * <i>London dispersion forces</i> * <i>dipole-dipole forces</i> * <i>hydrogen-bonding</i>	Fairly soft, low to moderate melting/boiling points, poor thermal and electrical conductor, variable solubility, some dissolve in water and many dissolve in nonpolar solvents	Ex: H_2O , I_2 , CO_2 , NH_3 , HCl , HCN , $C_{12}H_{22}O_{11}$ 
Ionic	Cations and Anions	Ion-ion (electrostatic attraction between cations and anions)	Hard and brittle, high melting/boiling, fair thermal conduction, no electrical conduction as a solid (but excellent electrical conduction when melted), many are soluble in water	Ex: $CaCl_2$, MgO , $(NH_4)_2SO_4$, $NaHCO_3$ 
Metallic	Atoms (metal)	Metallic bonding (metal atom cores in an "electron sea")	Soft to very hard, low to very high melting/boiling, highly malleable and ductile, excellent thermal and electrical conductivity, insoluble in water	Ex: all metallic elements, Fe , Cu , Na , etc. 
Network covalent	Atoms (nonmetal)	Covalent bonds (extensive "network" of covalent bonds connecting all atoms of the substance into a single enormous "molecule")	Very hard, very high melting/boiling, often poor electrical conduction (except graphite), fair thermal conduction, insoluble in water	Ex: boron nitride(BN), diamond(C), graphite(C), quartz(SiO_2) 