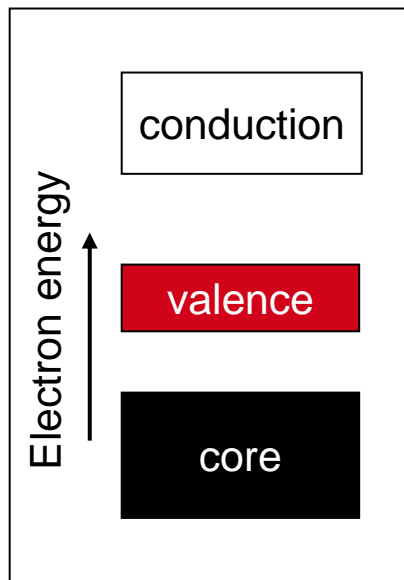
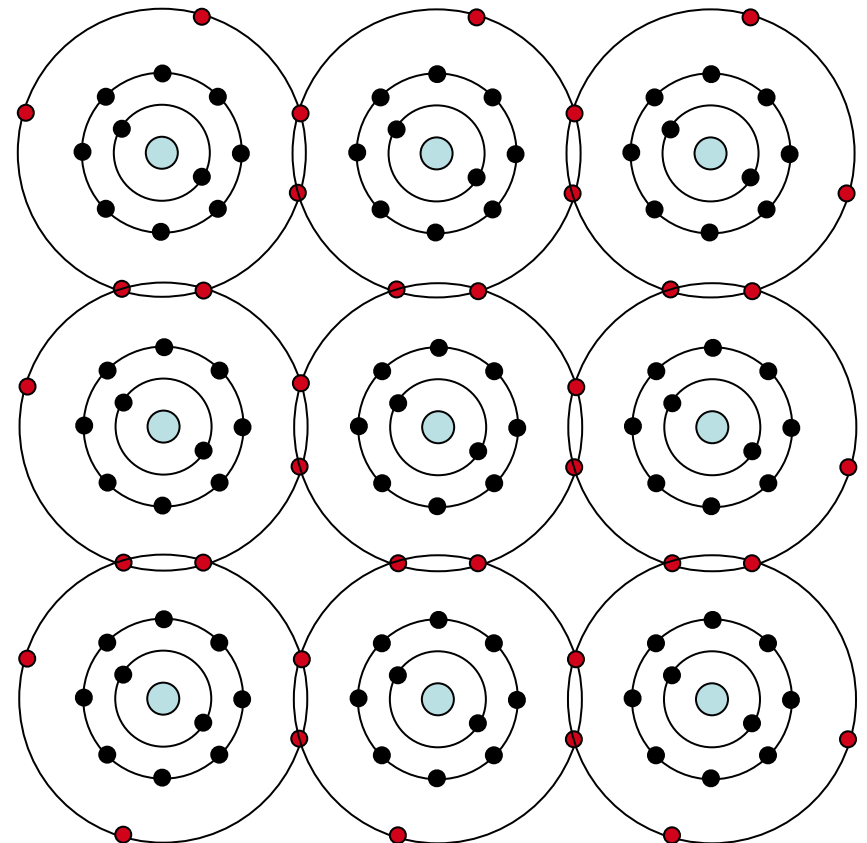
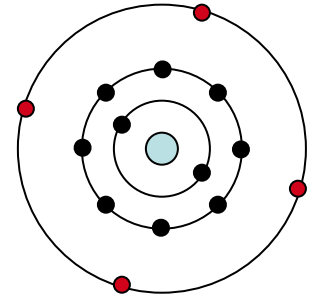


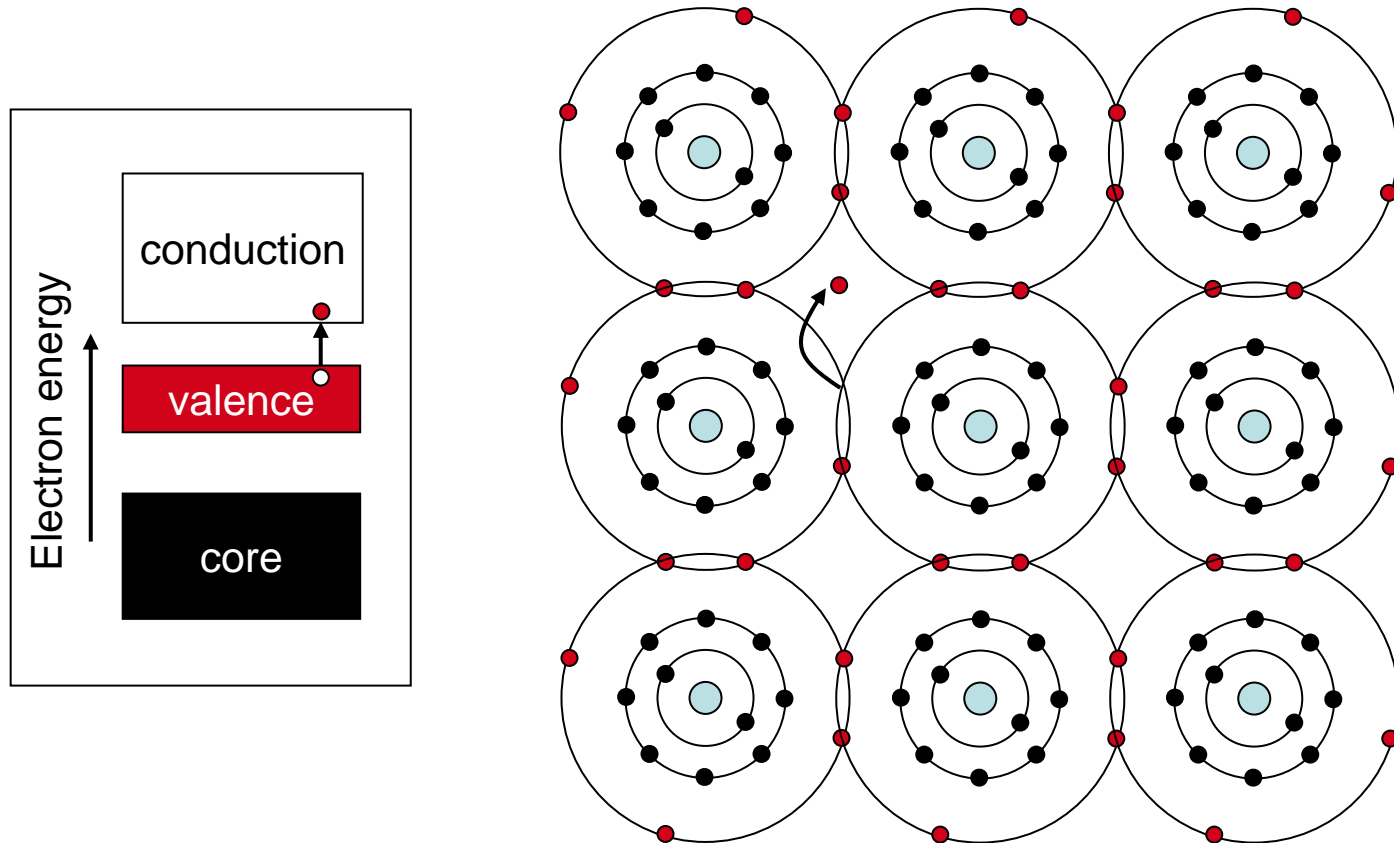
Electrons in solids

- Core shell electrons are tightly bound to atoms, and do not interact strongly with electrons in other atoms
- Valence shell electrons are the outer electrons that contribute to bonds between atoms
- If all of the bonds are “satisfied” by valence electrons, and if these bonds are strong, then the material does not conduct electricity - an **insulator**



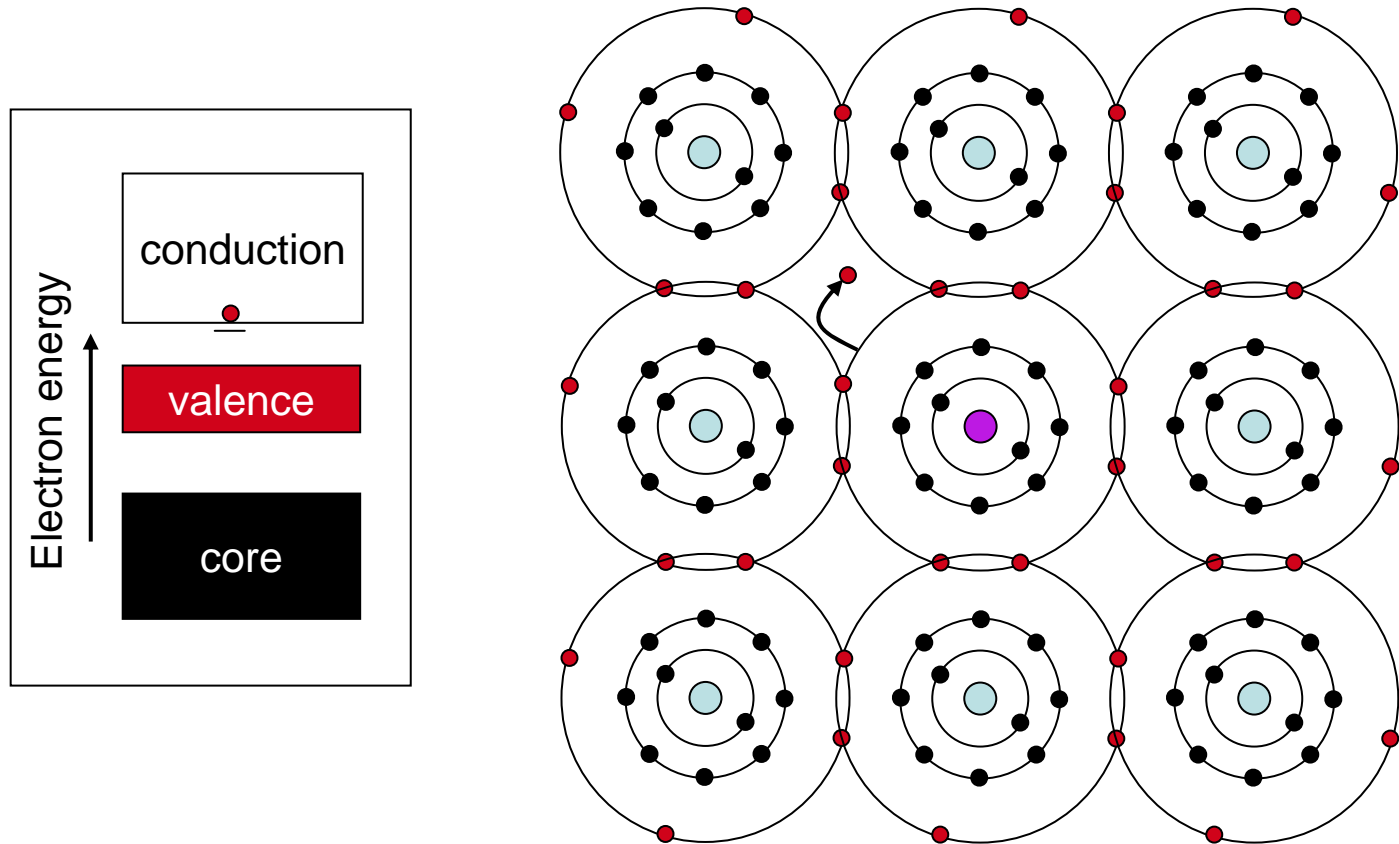
Electrons in solids

- If all the bonds are “satisfied”, but the bonds are relatively weak, then the material is an **intrinsic semiconductor**, and thermal energy can break a small number of bonds, releasing the electrons to conduct electricity



Electrons in solids

- If impurities with one more or one fewer electrons than a host atom are substituted for host atoms in a semiconductor, then the material becomes conductive - an **extrinsic semiconductor**



Electrons in solids

- If only a fraction of the bonds are satisfied (or alternatively, if there are many more electrons than are needed for bonding) then there is a high density of electrons that contribute to conduction, and the solid is a **metal**

