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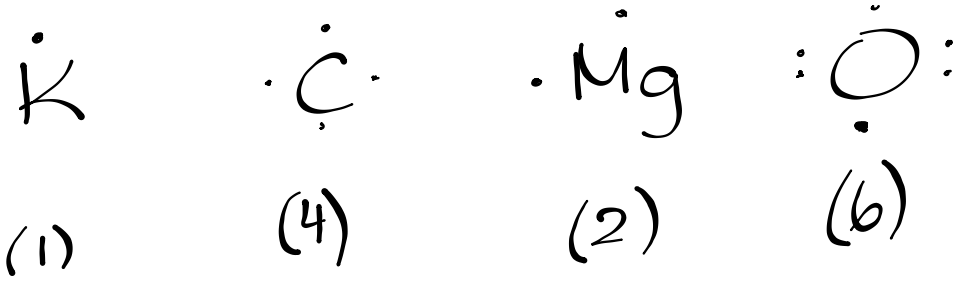


Cd^{2+} $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^8 5s^2$

46

Octet Rule → 8

ns^2np^6

Valence electrons

Formation of cations

Na $1s^2 2s^2 2p^6 3s^1$ $\xrightarrow{-e^-}$ $1s^2 2s^2 2p^6$

Na^+

Formation of anions

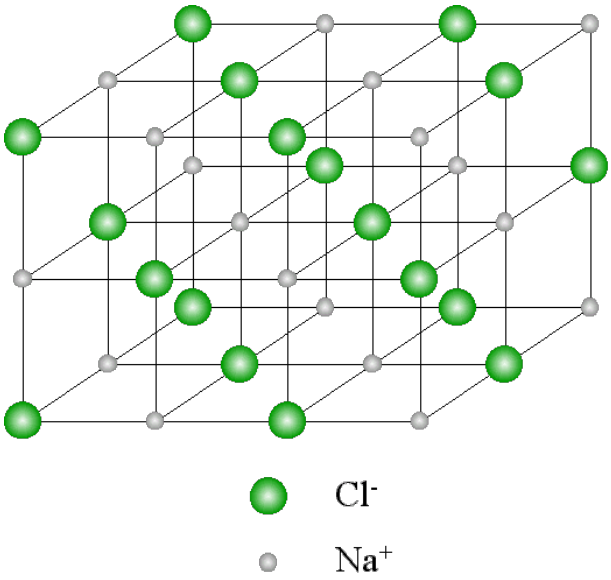
F $1s^2 2s^2 2p^5$ $\xrightarrow{+e^-}$ $1s^2 2s^2 2p^6$ F^-

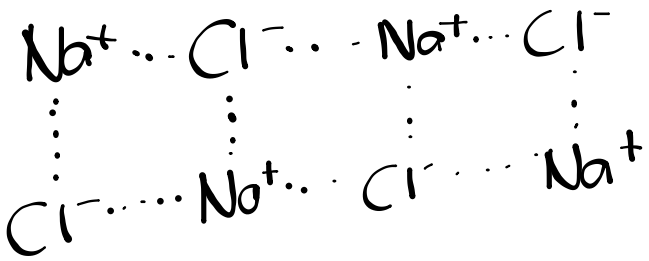
Table 7.1

Electron Dot Structure of Some Group A Elements

Period	Group 1A	2A	3A	4A	5A	6A	7A	8A
1	H·							He:
2	Li·	·Be·	·B·	·C·	·N·	·O·	·F·	:Ne:
3	Na·	·Mg·	·Al·	·Si·	·P·	·S·	·Cl·	:Ar:
4	K·	·Ca·	·Ga·	·Ge·	·As·	·Se·	·Br·	:Kr:

Crystal Structure of Ionic Solids





Ionic

Na Cl

transfer e⁻'s

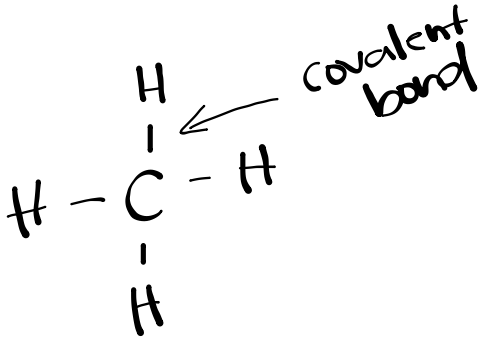
Na^+ Cl^-

attraction

(Ionic bond)

Covalent

Shared electrons



Metallic Bonds

Metals are made of closely packed cations rather than neutral atoms.

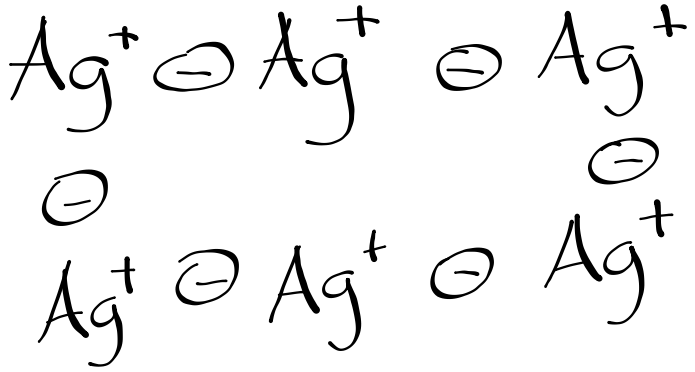
In metals, the valence electrons drift freely from one part of the metal to another.

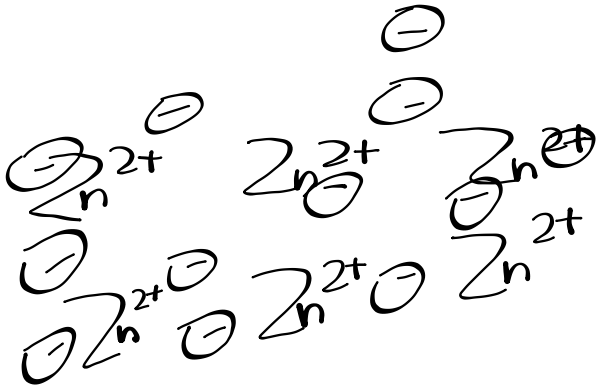
Metallic bonds consist of the free-floating valence electrons for the positively charged metal ions.

Ductility and Malleability

Metals - cations insulated by 'sea' of electrons

Ionic compounds - positive ions pushed together and repel, causing crystal to shatter.


Ag+ Ag+ Ag+
Ag+ Ag+ Ag+

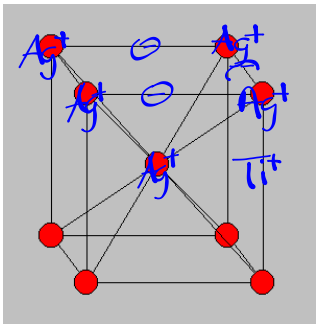

Zn2+ Zn2+ Zn2+
Zn2+ Zn2+ Zn2+

Crystalline Structure of Metals

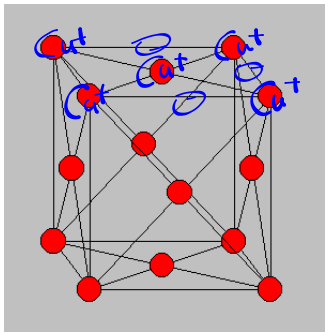
Metals are arranged in very compact and orderly patterns.

Closely-Packed Arrangements:

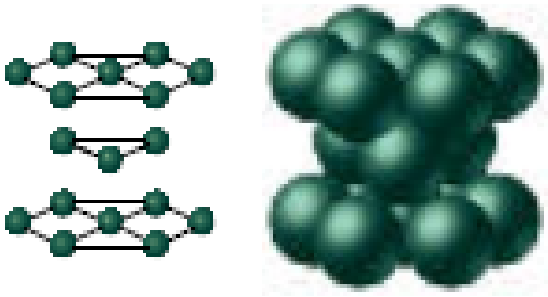
- Body-Centered Cubic



- Face-Centered Cubic



- Hexagonal Close-Packed



Hexagonal close-packed

Alloys

Alloys
Mixtures of two or more elements, at least one of which is a metal.

Table 7.3

Table 7.3
Composition of Some Common Alloys

Name	Composition (by mass)
Sterling silver	Ag 92.5% Cu 7.5%
Cast iron	Fe 96% C 4%
Stainless steel	Fe 80.6% Cr 18.0% C 0.4% Ni 1.0%
Spring steel	Fe 98.6% Cr 1.0% C 0.4%
Surgical steel	Fe 67% Cr 18% Ni 12% Mo 3%

Form in one of two ways:

1) Substitutional Alloys
If atoms of the alloy are about the same size, they can replace each other in the crystal.

2) Interstitial Alloys
If atomic sizes are quite different, smaller atoms can fit into the spaces between the larger atoms.

Homework

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Electronegativity

Electronegativity
The ability of an atom in a compound to attract electrons

Trends
- Within a group, electronegativity decreases from top to bottom
- Within a period, electronegativity increases from left to right

Ex. F

Table 6.2

Electronegativity Values for Selected Elements

H 2.1						
Li 1.0	Be 1.5	B 2.0	C 2.5	N 3.0	O 3.5	F 4.0
Na 0.9	Mg 1.2	Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0
K 0.8	Ca 1.0	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8
Rb 0.8	Sr 1.0	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5
Cs 0.7	Ba 0.9	Tl 1.8	Pb 1.9	Bi 1.9		

Covalent Bond

Recall that a **covalent bond** is a shared pair of electrons between two nonmetal atoms.

- Electrons are attracted to the positive nuclei
- Each atom wants to reach the electron configuration of a noble gas (ns^2np^6 - Octet Rule)

Single Covalent Bond

Two atoms held together by sharing a pair of electrons

Molecular Formula

F_2

Electron Dot Structure

Structural Formula

Lone pair (unshared pair)
A pair of valence electrons not shared between atoms