LECTURE #9

Note Title 2/1/2010

BRAVAIS LATTICES

ARRANGHENT OF ATOMS IN SPACE WITH THE FOLLOWING PROPERTIES

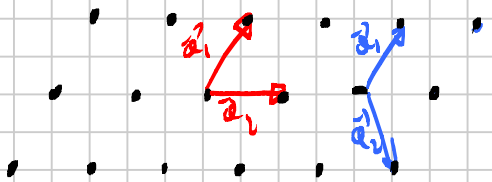
(1) SAME "VIEW" WHEN MOVE FROM ONE ATOM TO A DIFFERENT ONE

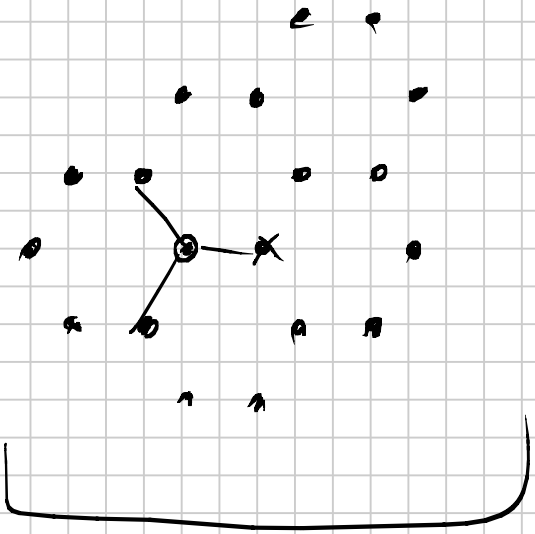
(2) $\vec{R} = n_1 \vec{a}_1 + n_2 \vec{a}_2 + n_3 \vec{a}_3$

$n_1, n_2, n_3 \in \mathbb{Z}$ (INTER)

$\vec{a}_1, \vec{a}_2, \vec{a}_3$ 3 NON PARALLEL PRIMITIVE VECTORS (IN GENERAL NON ORTHOGONAL)

2D

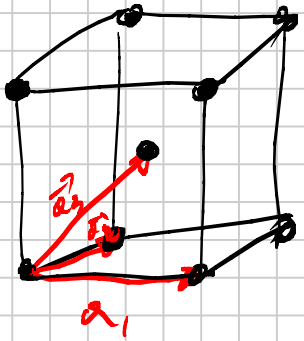




NOT A BRAVAIS LATTICE

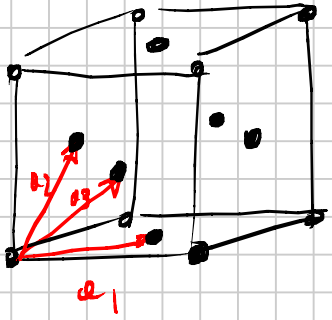
3D CUBIC

BODY CENTERED CUBIC

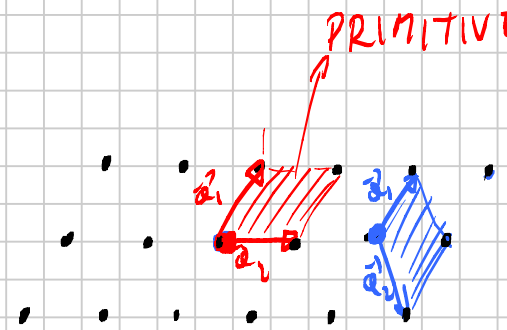


BCC

FACE CENTERED CUBIC



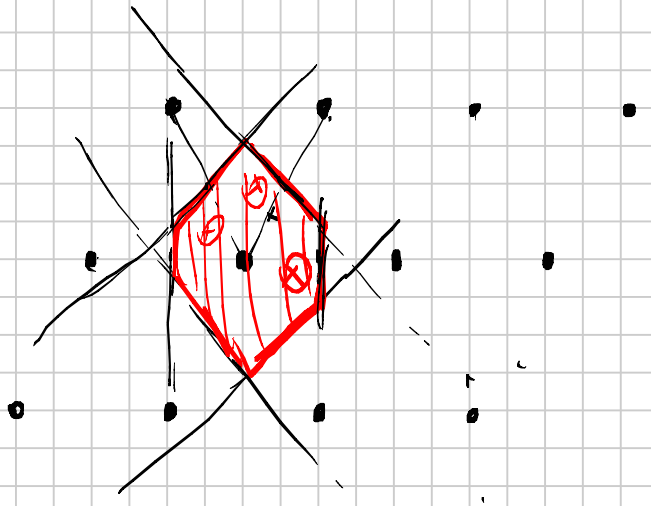
PRIMITIVE UNIT CELL



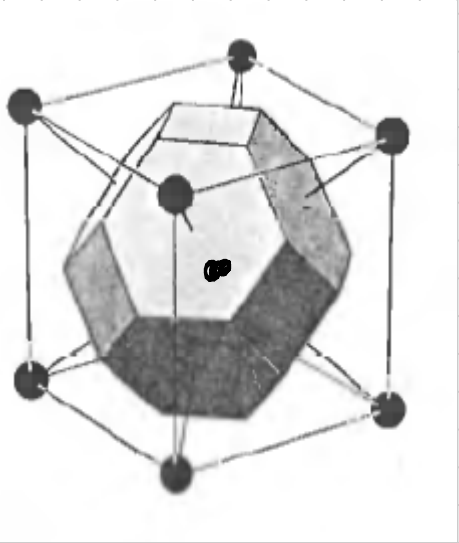
1 ATOM / UNIT CELL

"DENSITY" = $\frac{1}{\text{AREA OF UNIT CELL}}$

WIGNER-SEITZ CELL = UNIT CELL WITH ATOM AT THE CENTER

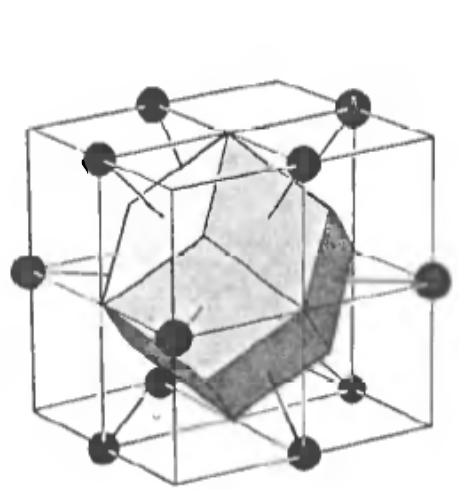


"VORONOI" PARTITION OF SPACE



WS CELL FOR BCC

TRUNCATED OCTAHEDRON



WS FOR FCC

RHOMBIC DODECAHEDRON

LATTICE WITH BASIS

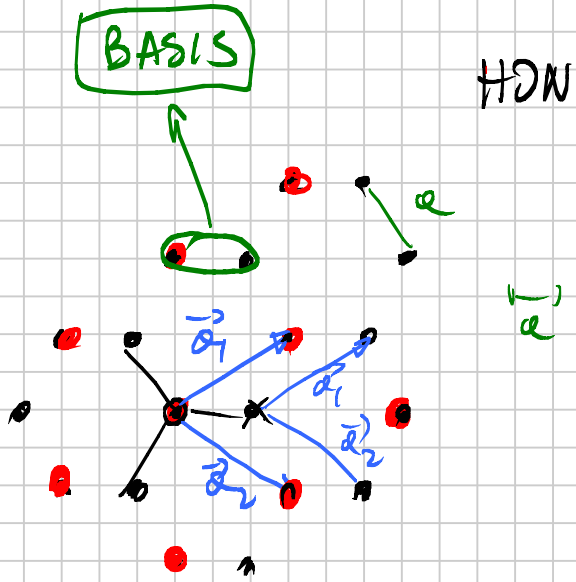
- BRAVAIS A
- BRAVAIS B

PRIMITIVE VECTORS

$\vec{a}_1$, $\vec{a}_2$

$\vec{b}_A = 0$

$\vec{b}_B = (a, 0)$



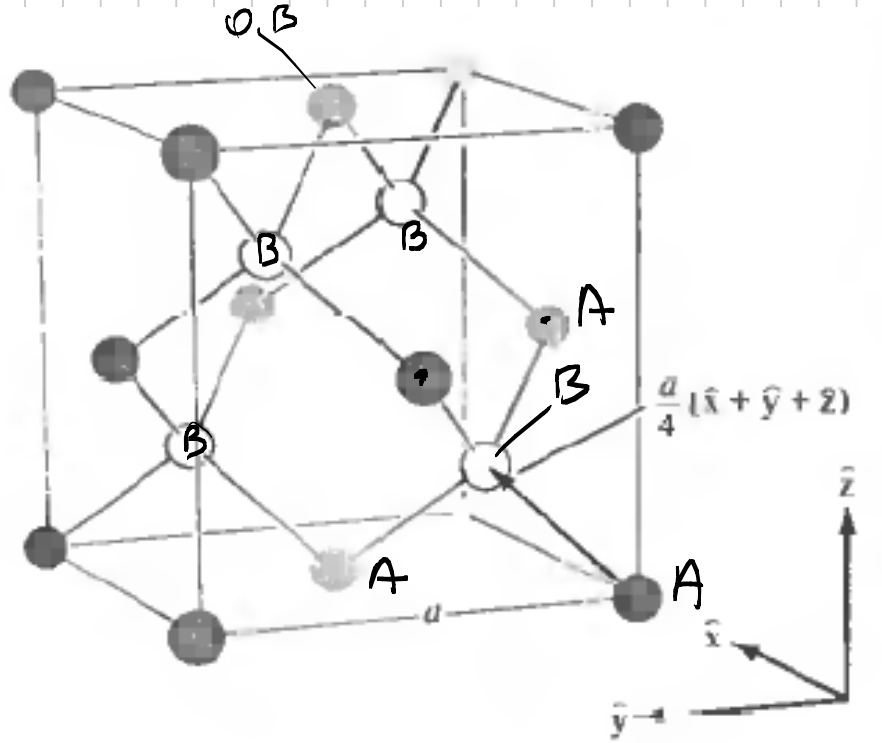
HONEYCOMB LATTICE

$\vec{a}_1$, $\vec{a}_2$, $\vec{a}_3$ FCC

+

$\vec{b}_A = 0$

$\vec{b}_B = \frac{a}{4}(1,1,1)$



DIAMOND LATTICE

C - Si - Ge

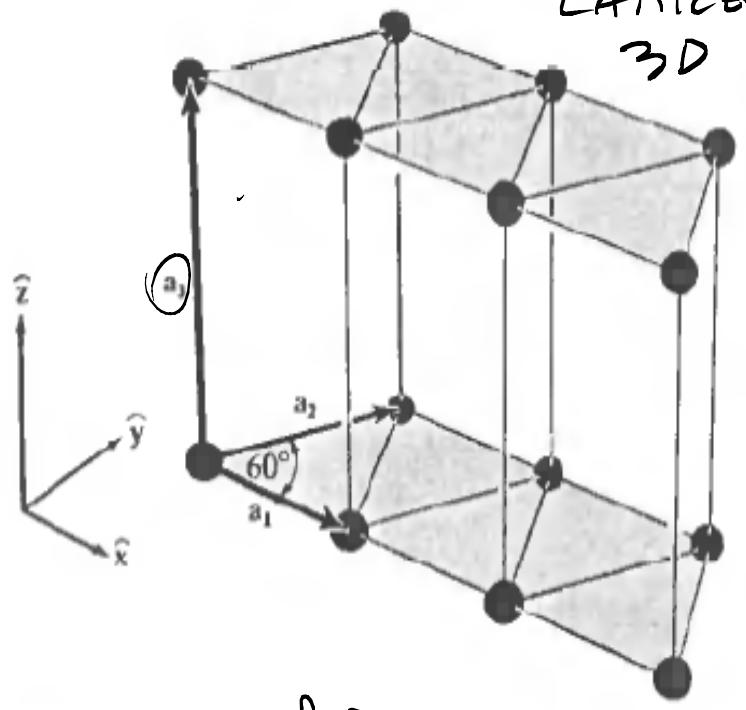
GaAs

A → Ga
B → As

} ZINC BLEND LATTICE (ZnS)

HEXAGONAL LATTICE

HEXAGONAL LATTICE 3D

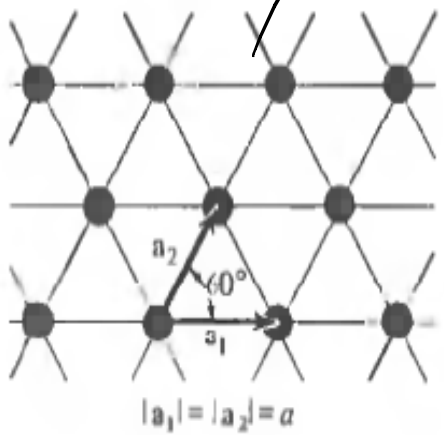


BRAVAIS

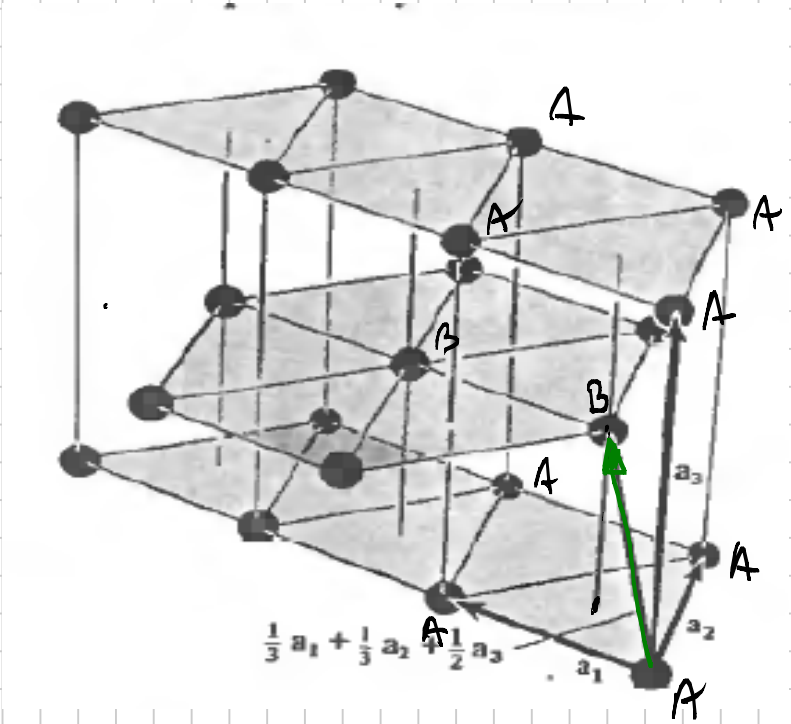
Figure 4.19

HEXAGONAL LATTICE

BRAVAIS



HEXAGONAL CLOSED PACKED HCP



$$\vec{b}_A = 0$$

$$\vec{b}_B = \frac{\vec{a}_1}{3} + \frac{\vec{a}_2}{3} + \frac{\vec{a}_3}{2}$$