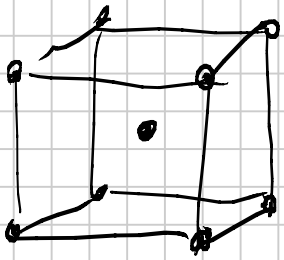
LECTURE # 11

Note Title 10/8/2008

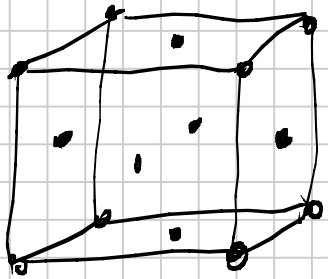
BRAVAIS LATTICE

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

$\vec{a}_1, \vec{a}_2, \vec{a}_3$ } PRIMITIVE VECTORS

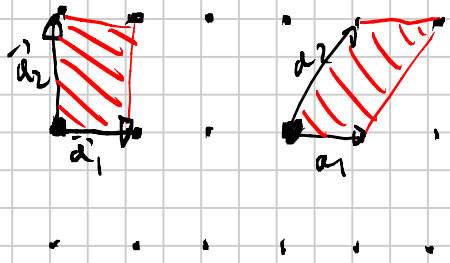


BCC



FCC

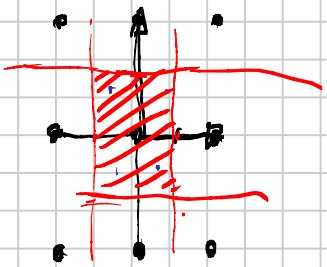
PRIMITIVE UNIT CELL

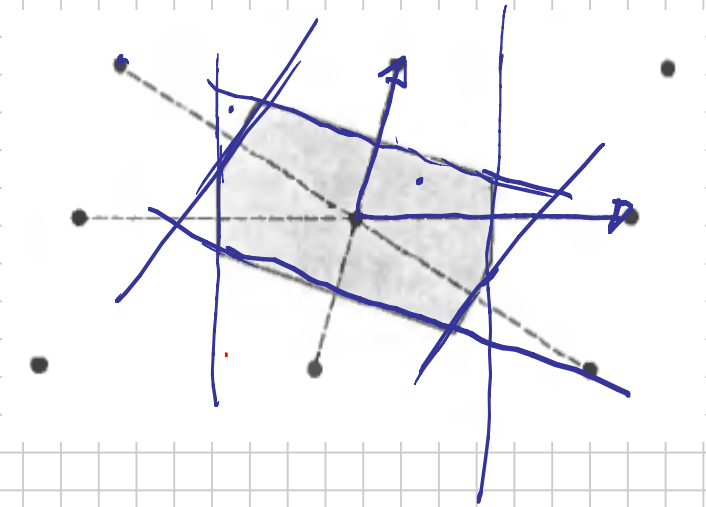


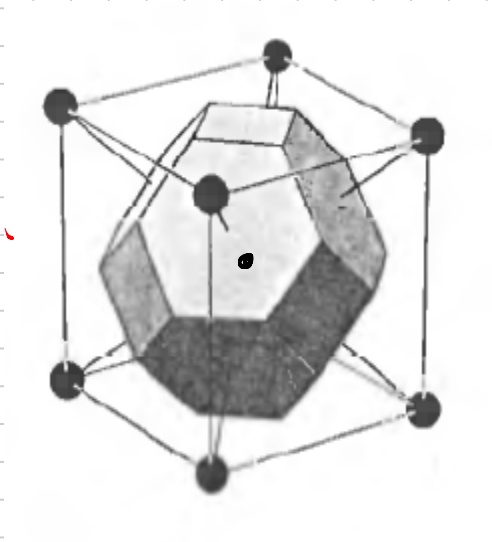
ONLY 1 ATOM PER UNIT-CELL

$$M(\text{DENSITY ATOMS}) = \frac{1}{\text{AREA (OF UNIT CELL)}}$$

→ WIGNER-SEITZ CELL



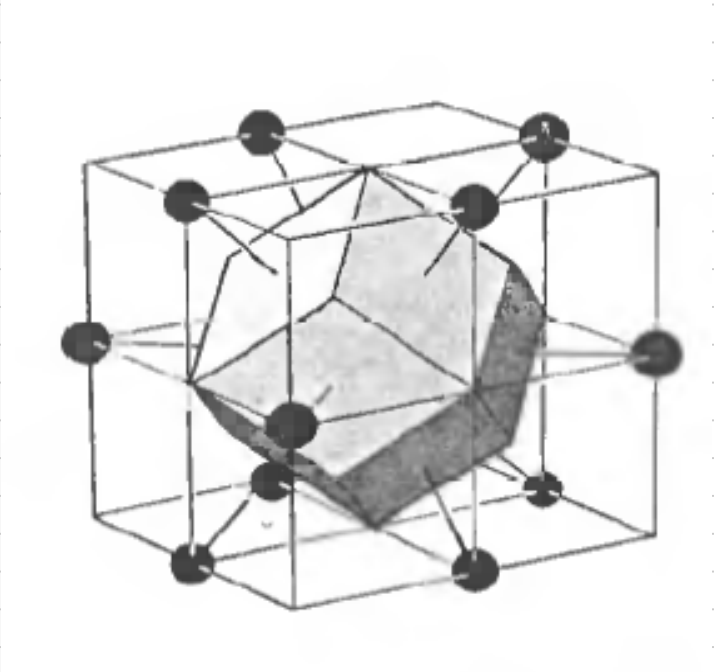




$\forall x \in$ WIGNER-SEITZ UNIT CELL

THE CLOSEST ATOM IS THE ONE AT THE CENTER OF THE CELL

BCC WS CELL = TRUNCATED OCTAHEDRON



FCC

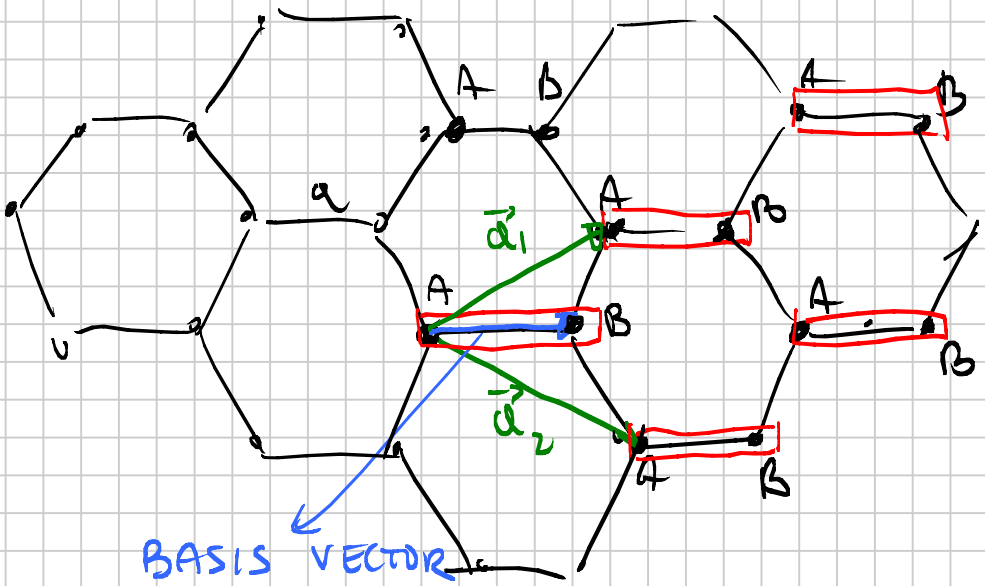
TRUNCATED

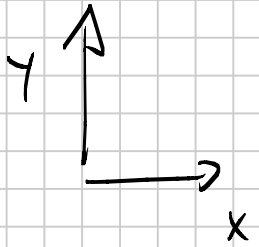
DODECAHEDRON

12 NEIGHBORS

HONEYCOMB LATTICE

LATTICE WITH A BASIS



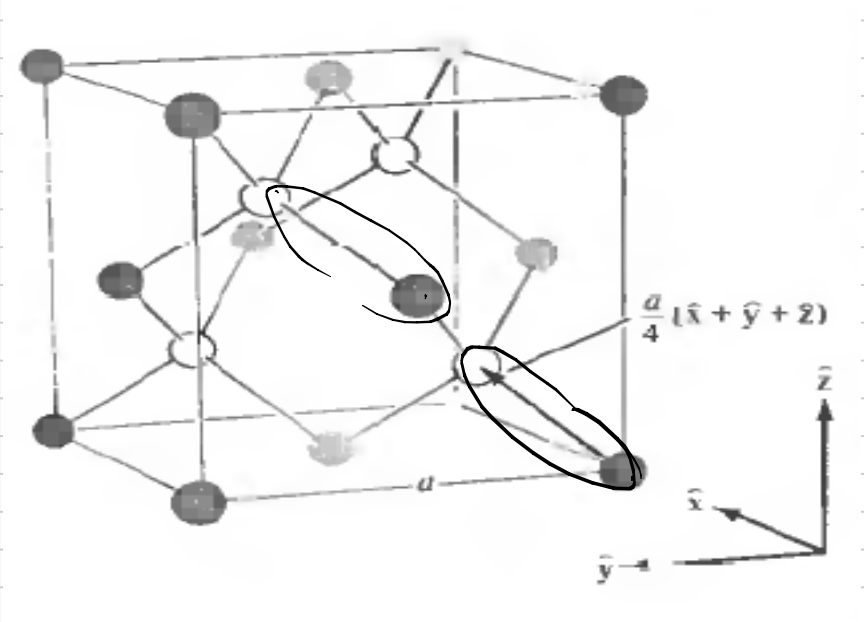


TAKE A AND B TOGETHER

LATTICE WITH A BASIS

CRYSTAL STRUCTURE $\left\{ \vec{a}_1 \quad \vec{a}_2 \right.$ AS PRIMITIVE VECTORS

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



DIAMOND LATTICE

FCC

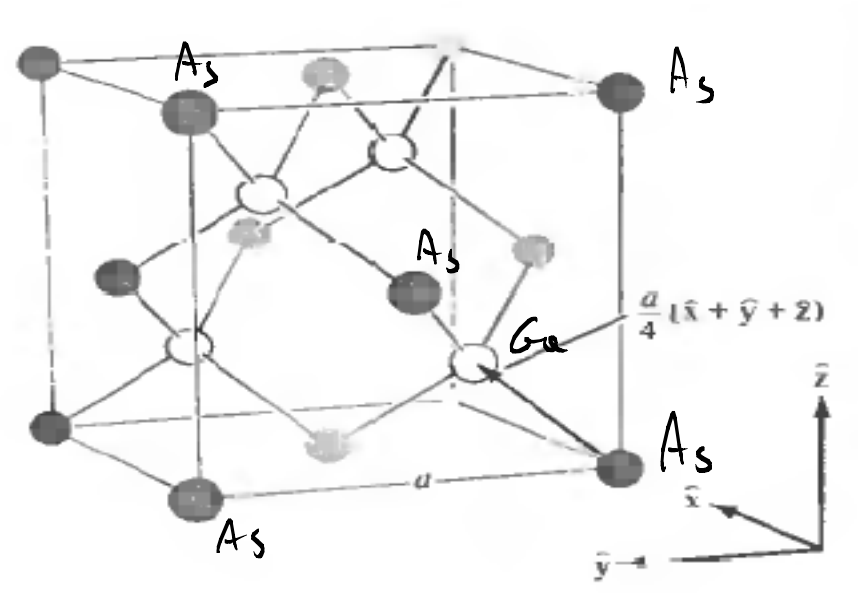
$$\vec{a}_1 = \frac{a}{2}(110)$$
$$\vec{a}_2 = \frac{a}{2}(101)$$
$$\vec{a}_3 = \frac{a}{2}(011)$$

$$\vec{b}_0 = 0 \qquad \vec{b}_1 = \frac{a}{4}(111)$$

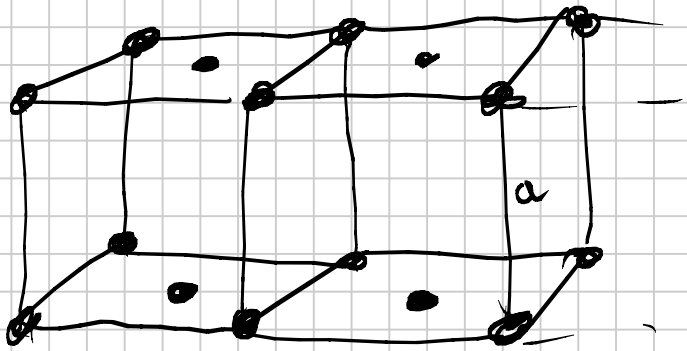
C, Si, Ge

GaAs, CdTe

ZINC BLEND



① BASE CENTERED CUBIC

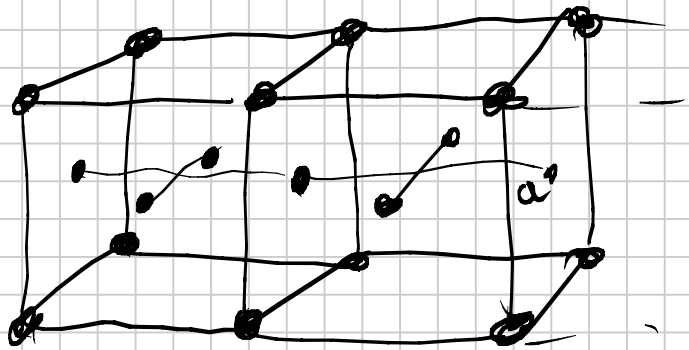


① BRAVAIS LATTICE ? $\vec{a}_1\ \vec{a}_2\ \vec{a}_3$?

② BASIS ?

③ DENSITY ?

② SIDE-CENTERED CUBIC



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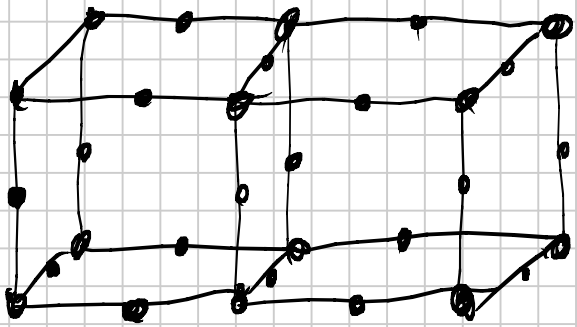
③



EDGE CENTERED CUBIC

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