Voids in lattice

Thapar Institute of Engineering & Technology
(Deemed to be University)
Bhadson Road, Patiala, Punjab, Pin-147004
Contact No. : +91-175-2393201
Email : info@thapar.edu

THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
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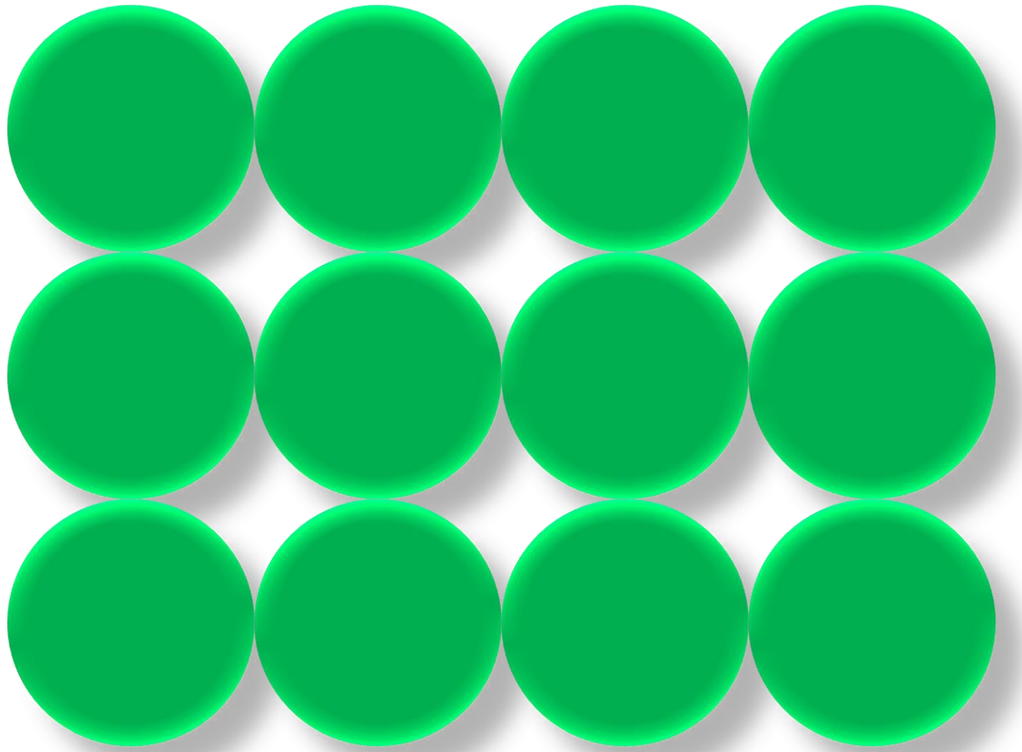
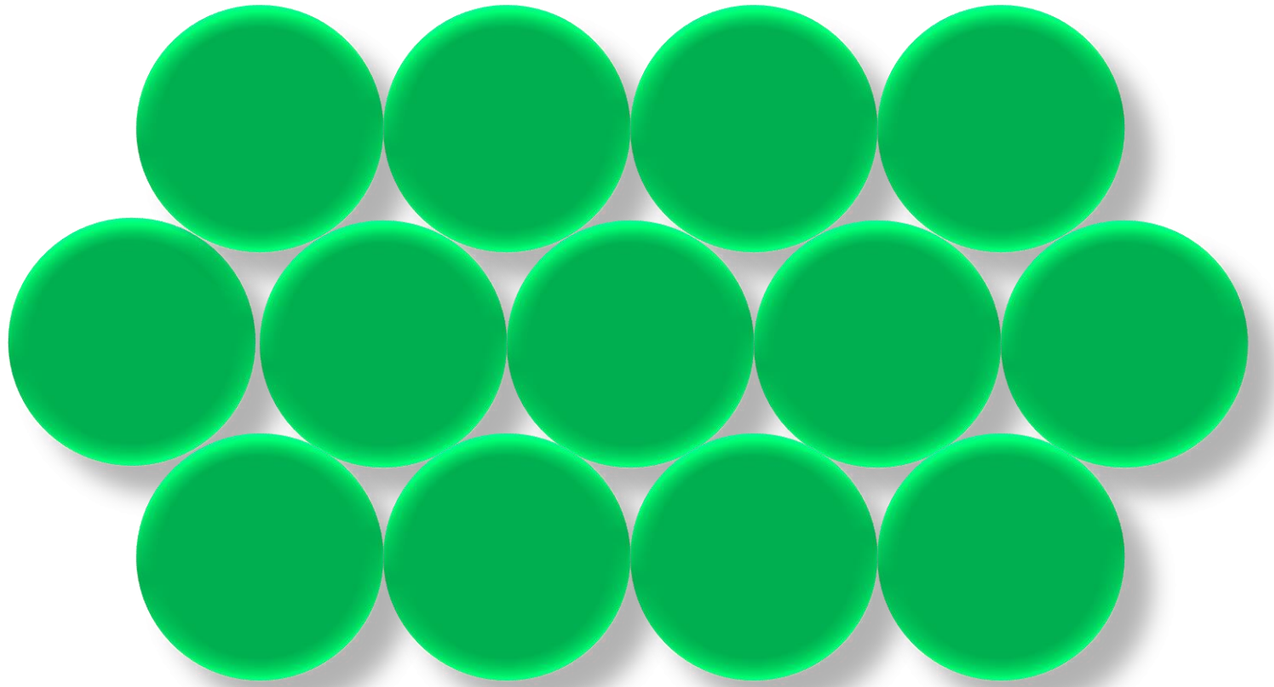
What are voids?

SC



FCC/HCP A layer

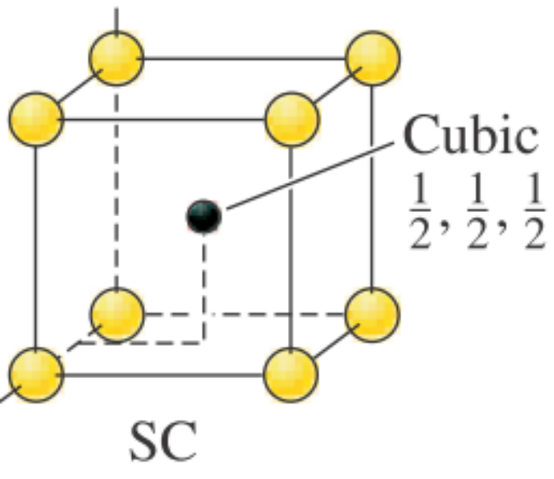


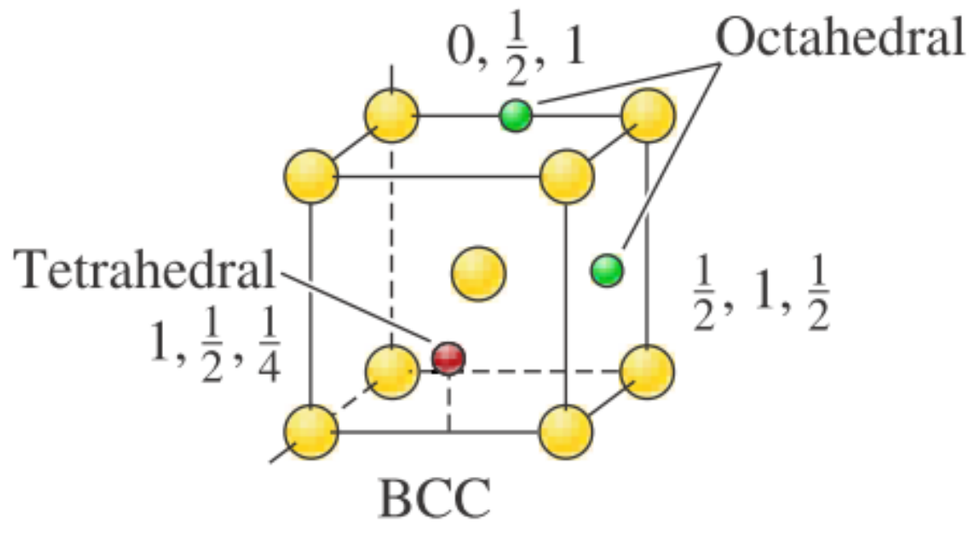
Voids in Crystals

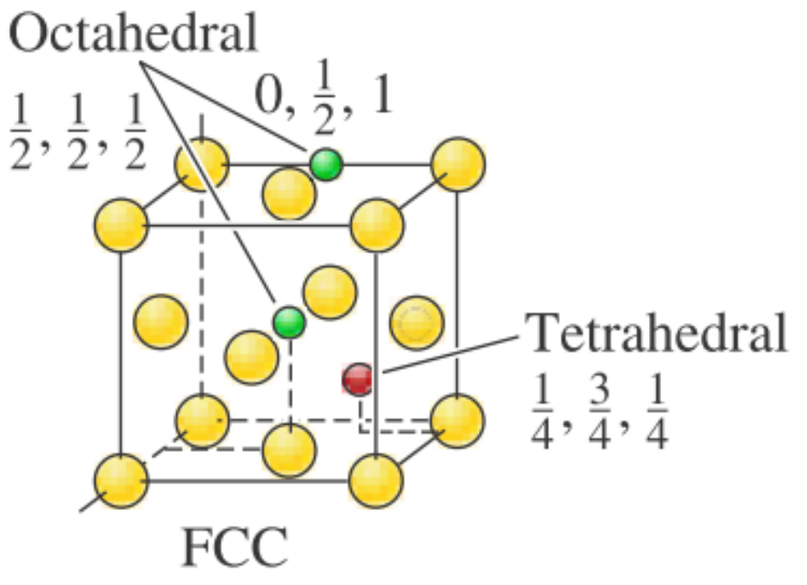
Tetrahedral voids: CN - 4

Octahedral void: CN - 6

Cubic void: CN - 8

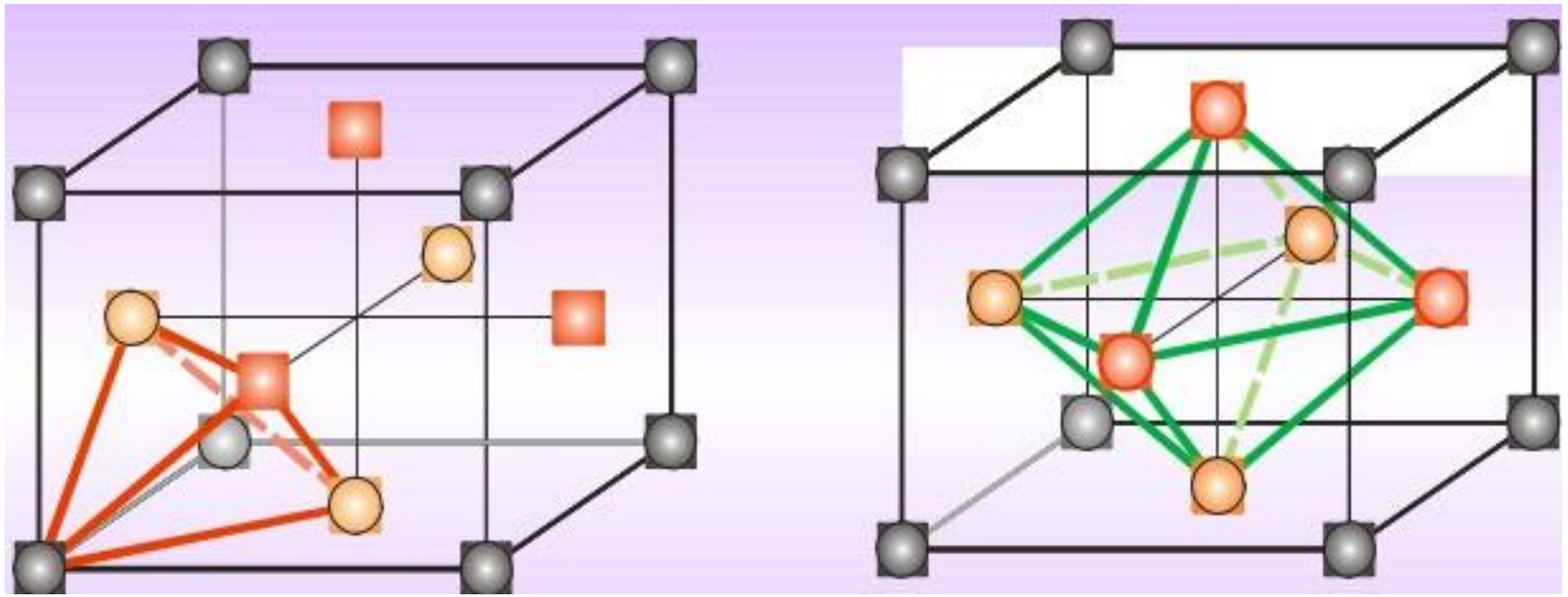


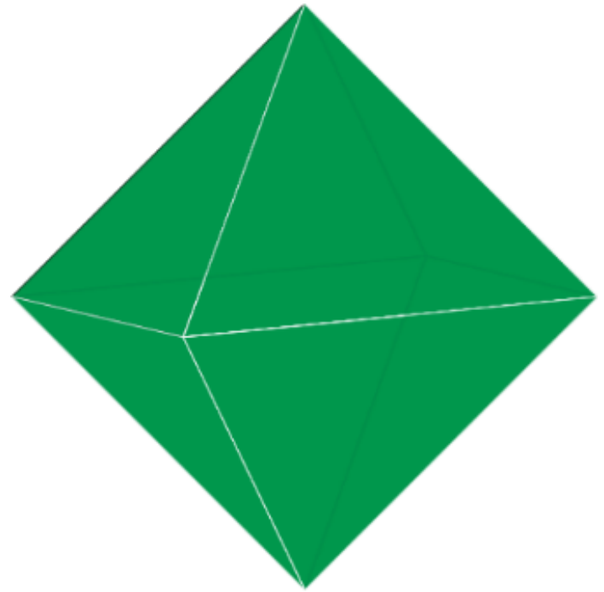


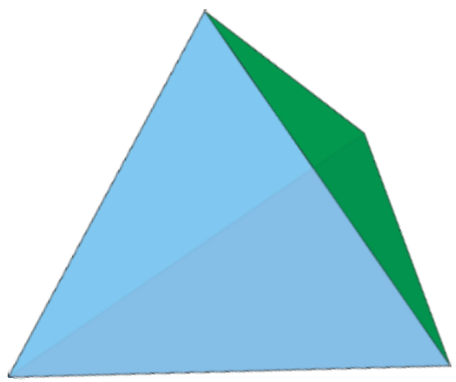


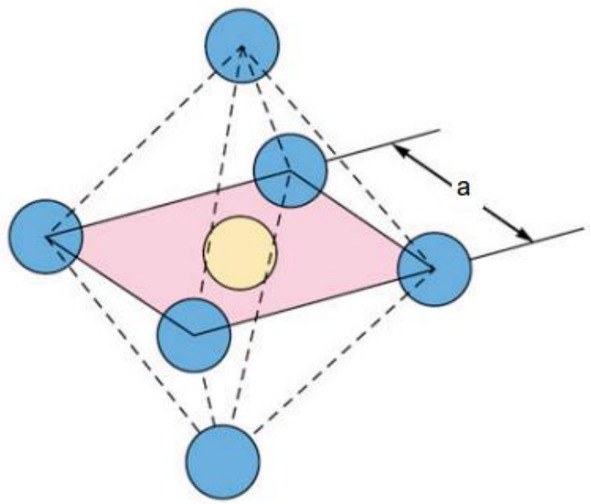
Voids in crystals

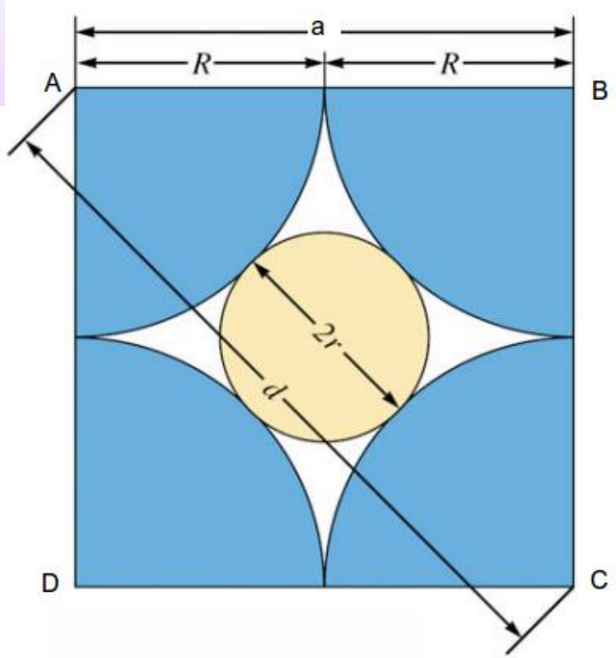
Tetrahedral and Octahedral voids





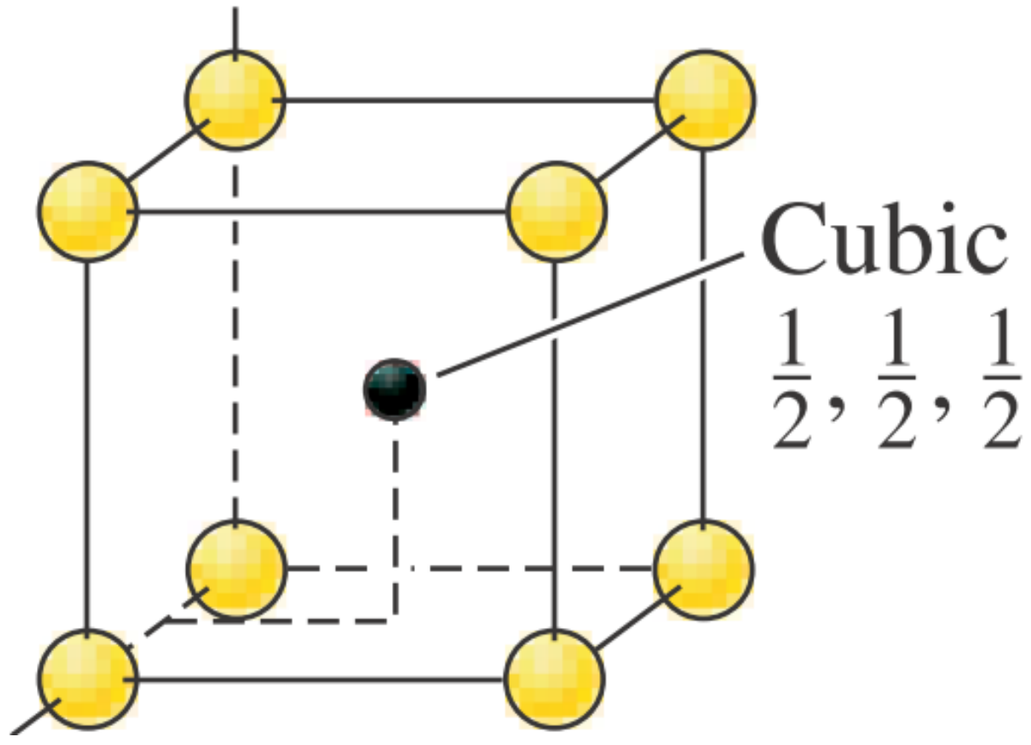






Voids in SC

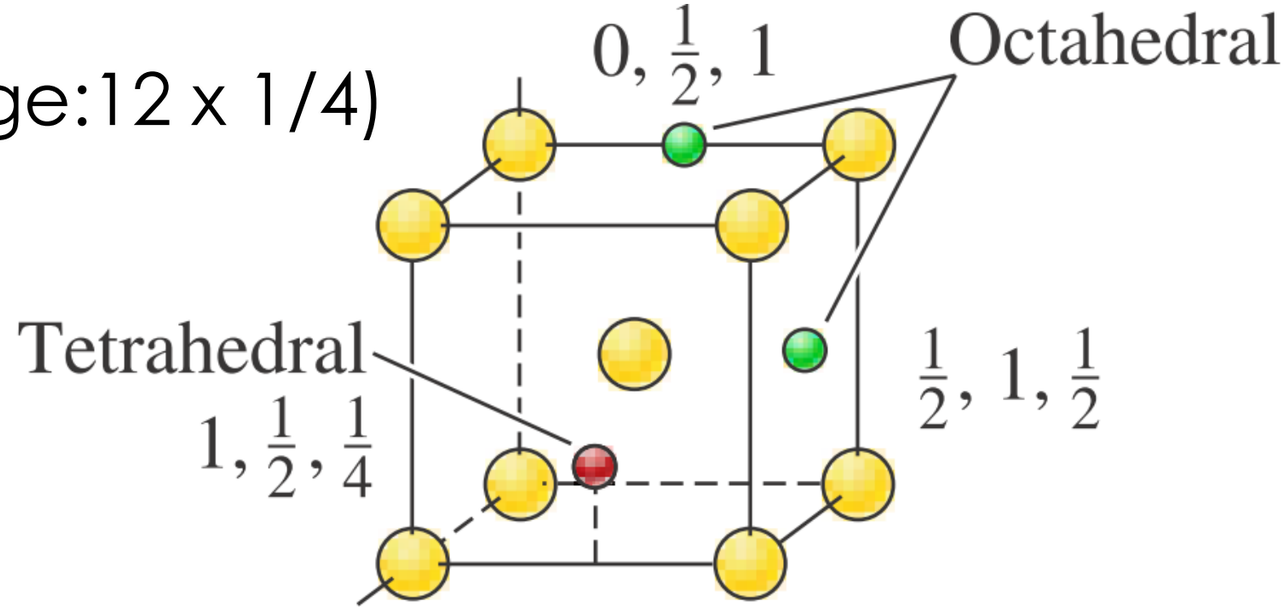
No of Cubic void – 01

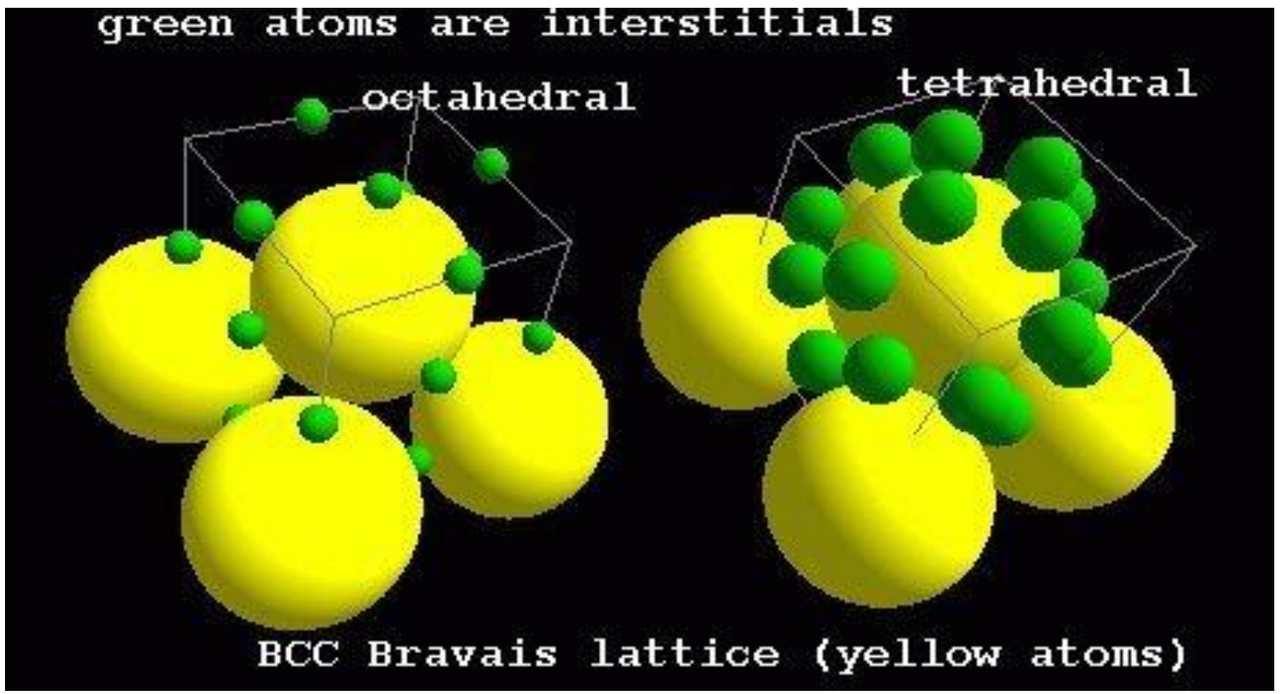


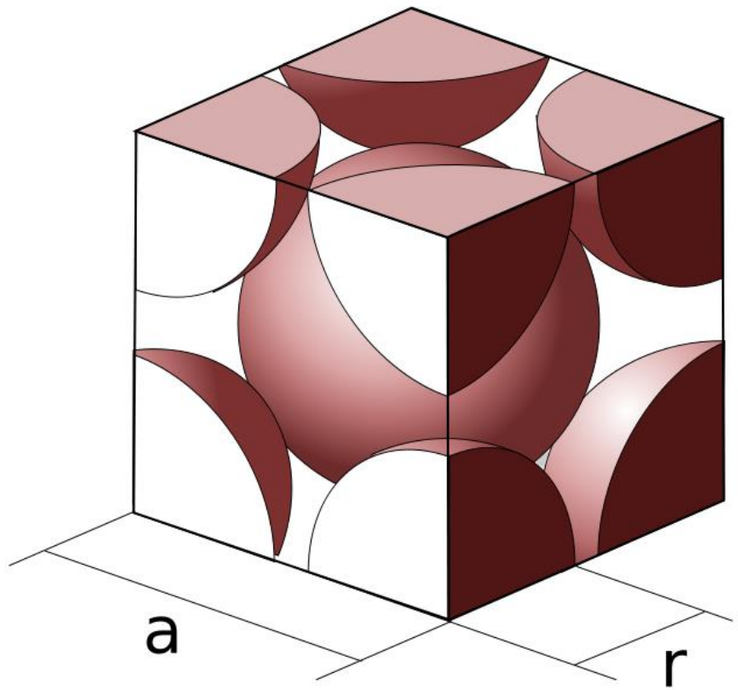
Voids in BCC

No of O.V. – 06 (Face:6 x1/2, Edge:12 x 1/4)

No. of T.V. – 12 (1/2 x 4 x 6)

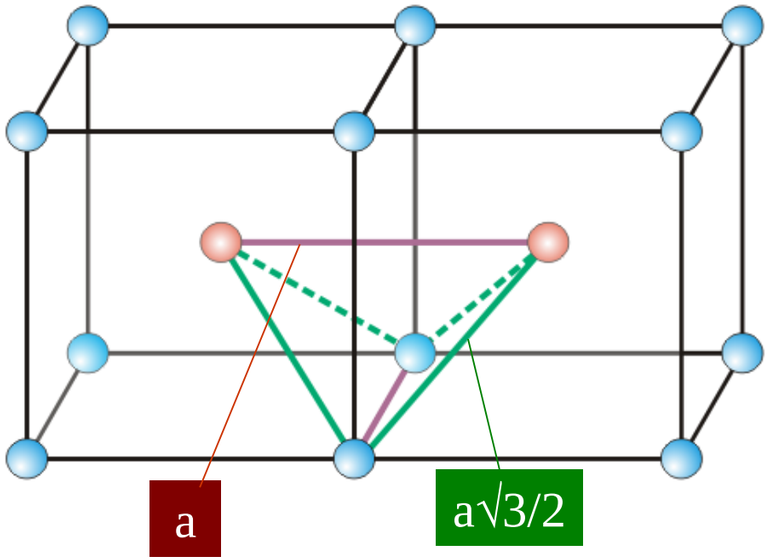




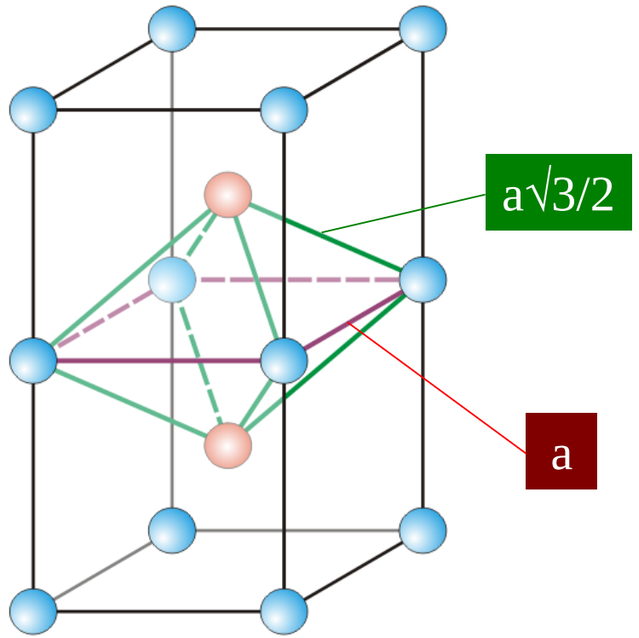


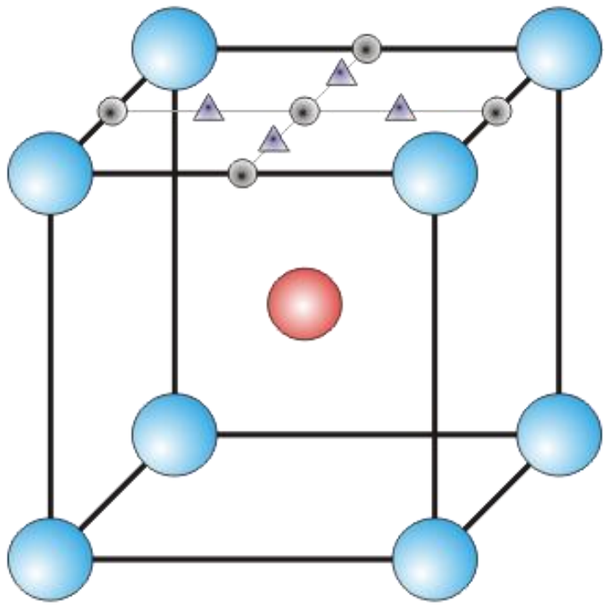
Voids in BCC

Distorted Tetrahedral



Distorted Octahedral



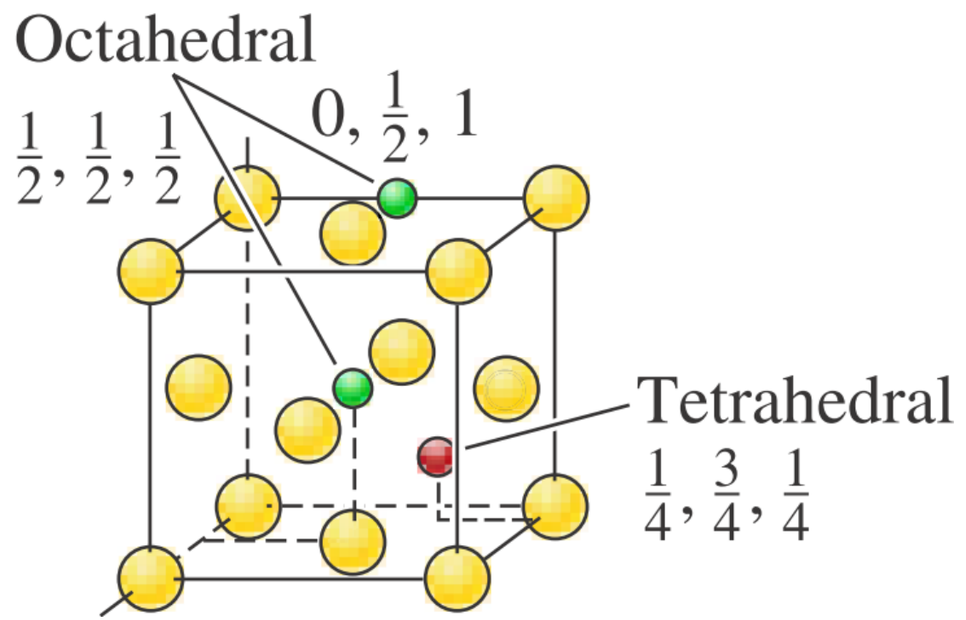


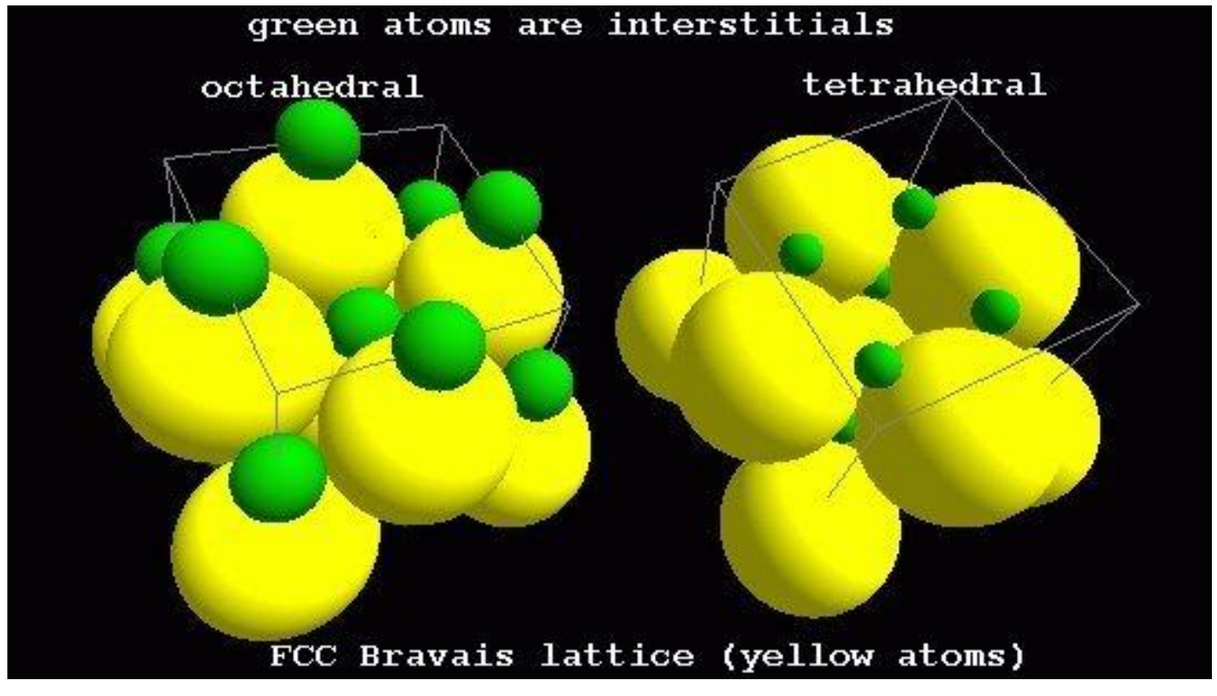
Note: Atoms are coloured differently but are the same

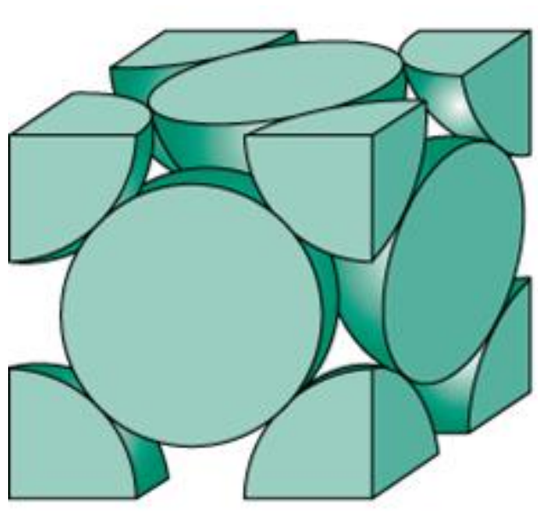
Voids in FCC

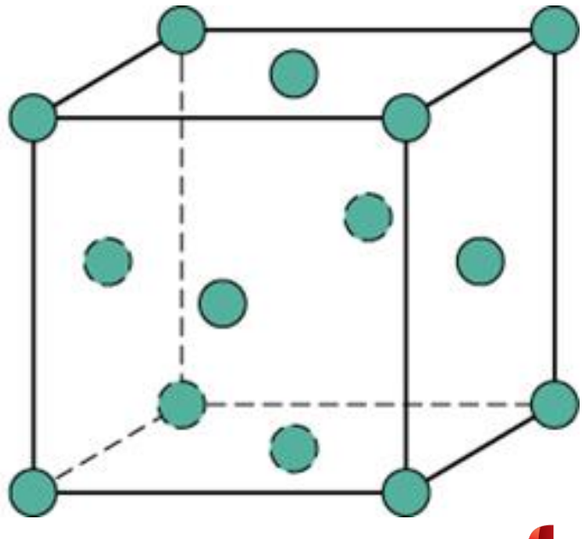
No of O.V. – 4 (Edge: 12 x 1/4, Body:1)

No. of T.V. – 8 (Body diagonal: 4 x 2)

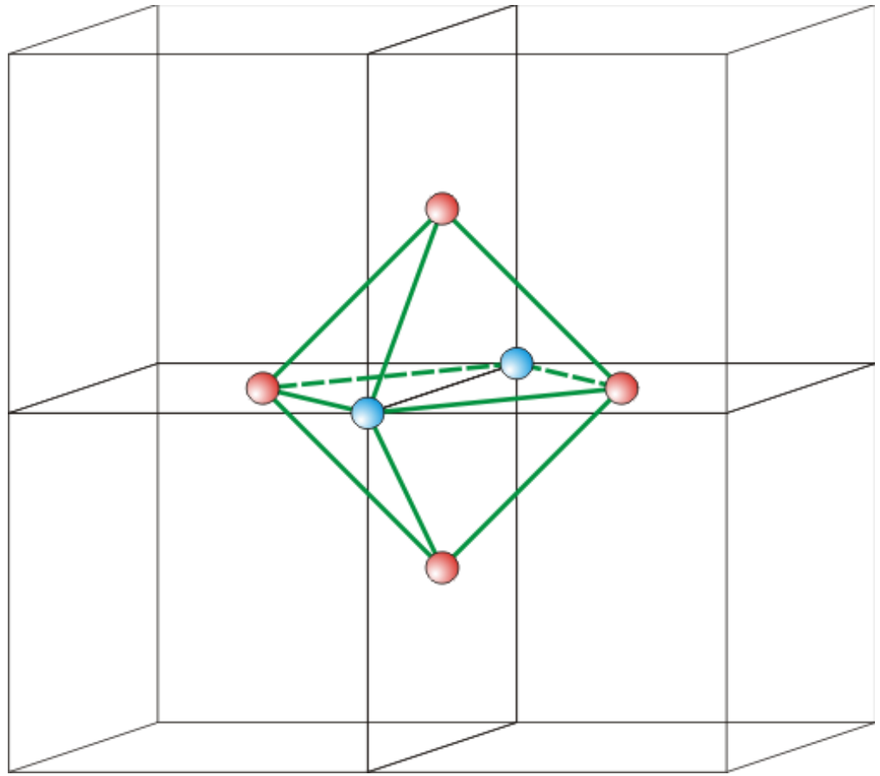


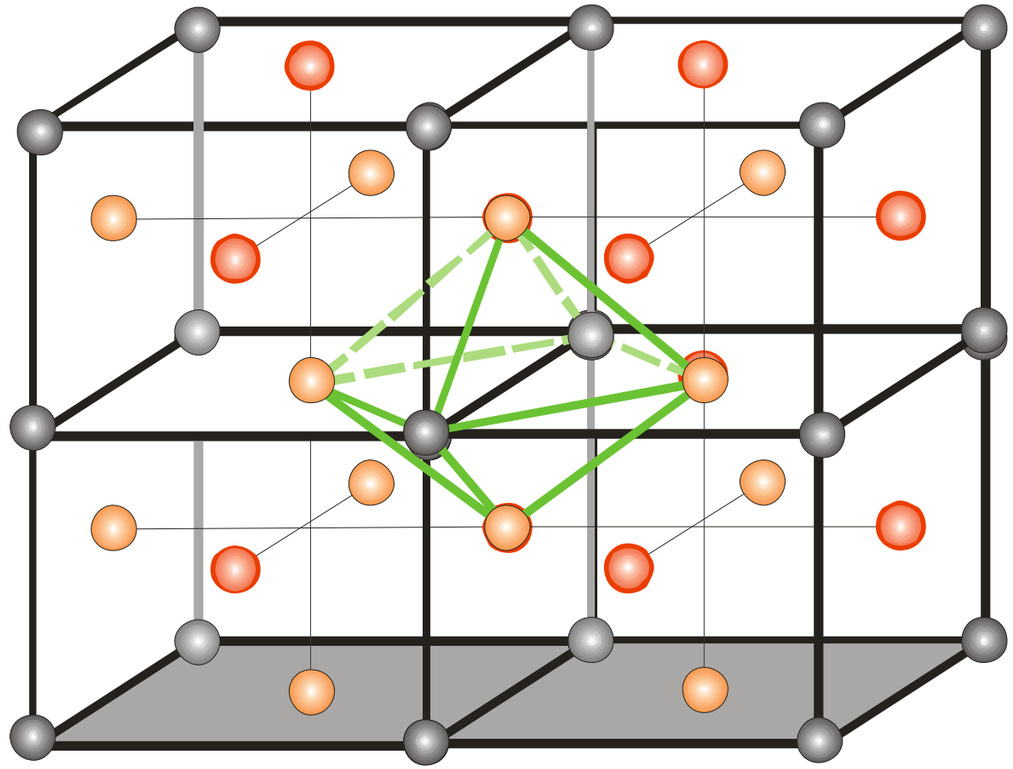






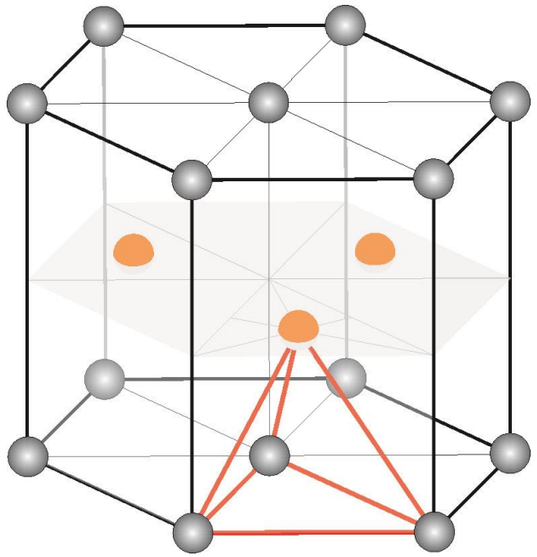
Voids in FCC: Octahedral Voids

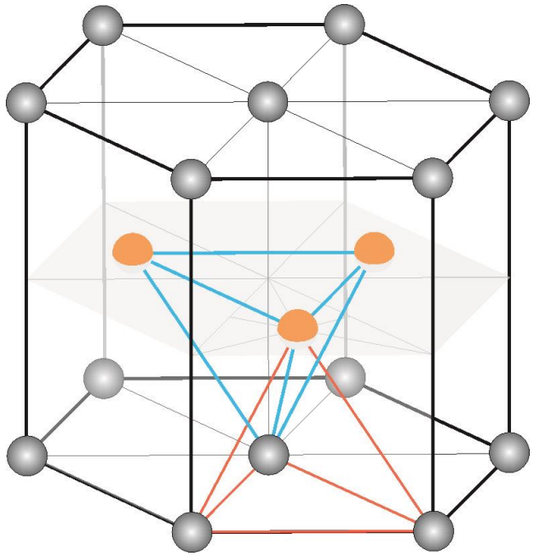


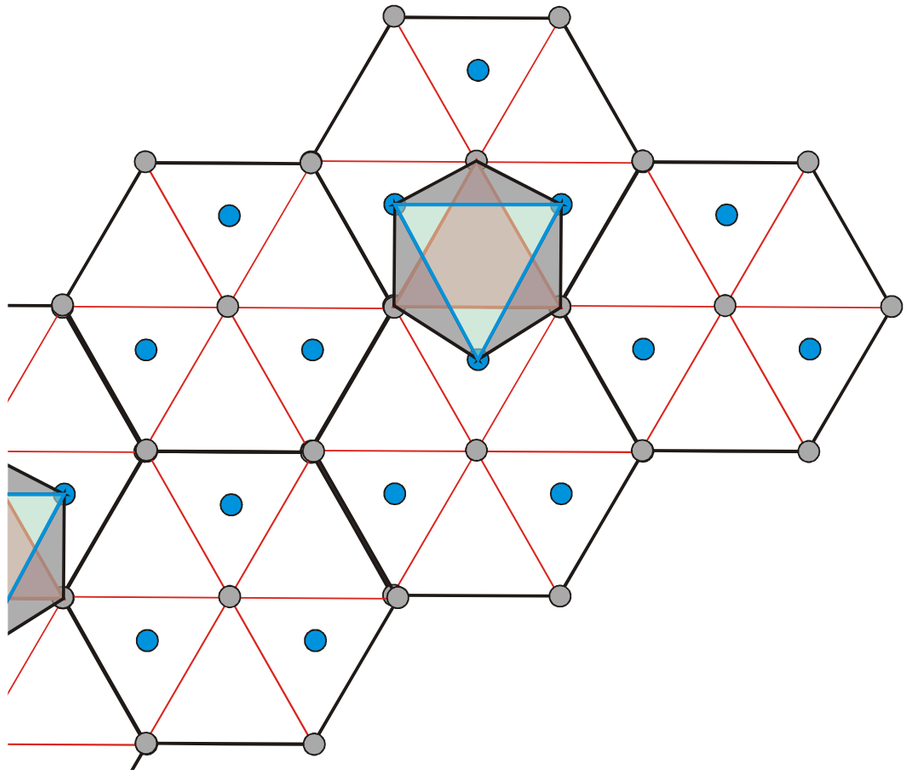


Voids in HCP: Tetrahedral Voids

No. of Tetrahedral Voids – 12

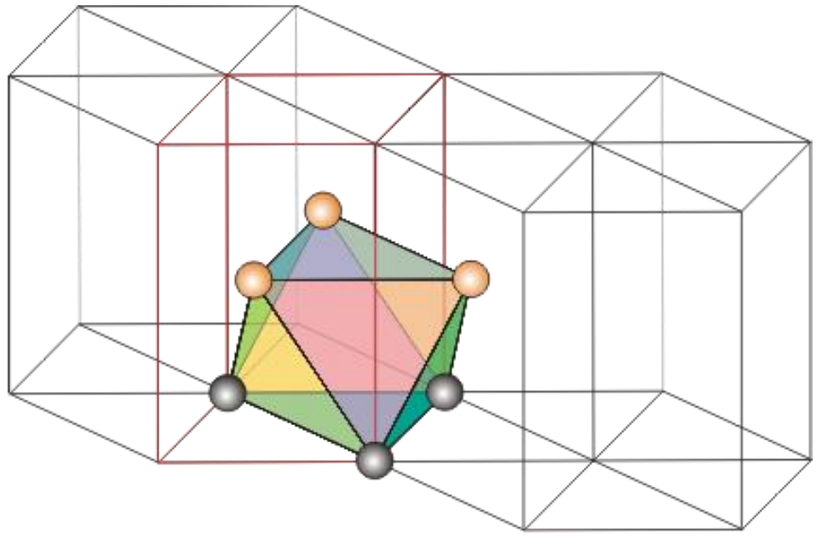


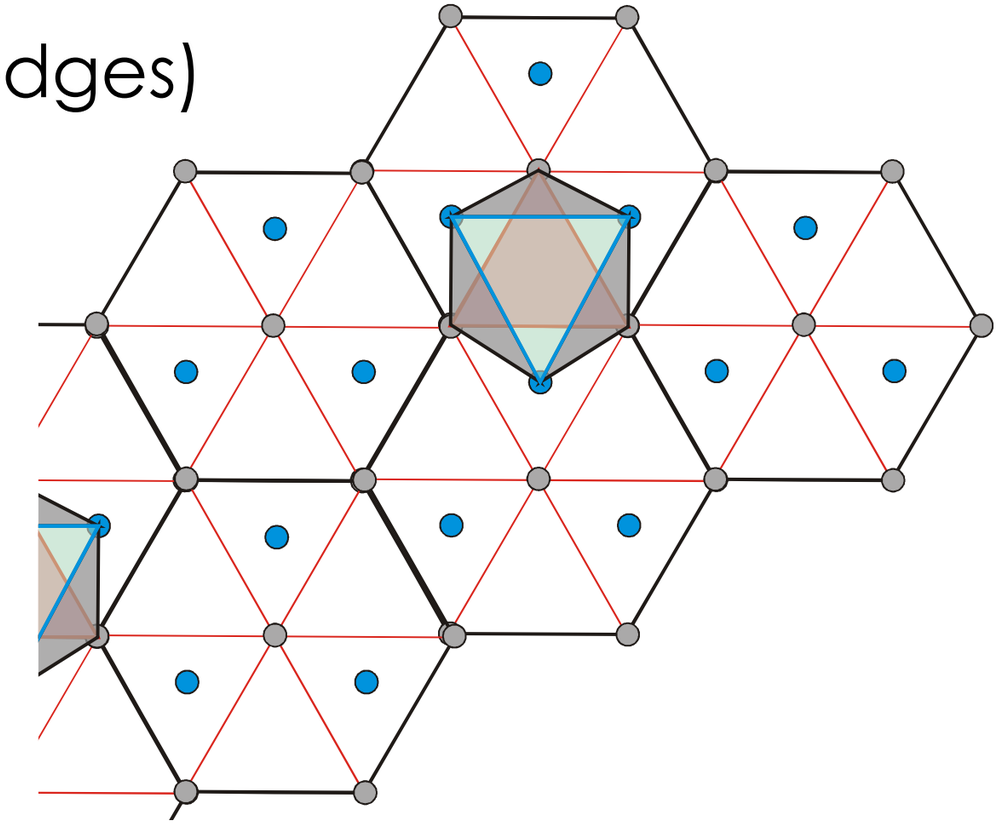




Voids in HCP: Octahedral Voids

No of O.V. – 6 (1/2 x 12 at the sharing of edges)





Remember

Crystal structure	Octahedral Voids	Tetrahedral Voids	Cubic Voids
SC	--	--	01
BCC	06	12	--
FCC	04	08	--
HCP	06	12	--

Summary

1. Void is the free/empty space between the atoms.
2. Tetrahedral voids have CN-4
3. Octahedral voids have CN-6
4. Cubic voids have CN-8

Assignments

1. In an FCC lattice, the largest interstitial voids occur at positions like (½, 0, 0), (0, ½, 0), (0, 0, ½) etc. γ-iron crystallizes in FCC structure. Find atomic radius of the largest interstitial void in γ-iron.
2. Find the diameter of the largest atom that would fit an interstitial void in FCC nickel without distortion.
3. Find the size of the largest sphere that will fit an interstitial void in a BCC crystal as a function of the atomic radius r. The void is located at (0, ½, ¼) and the other equivalent positions.