Nishant Jindal

SOLID STATE

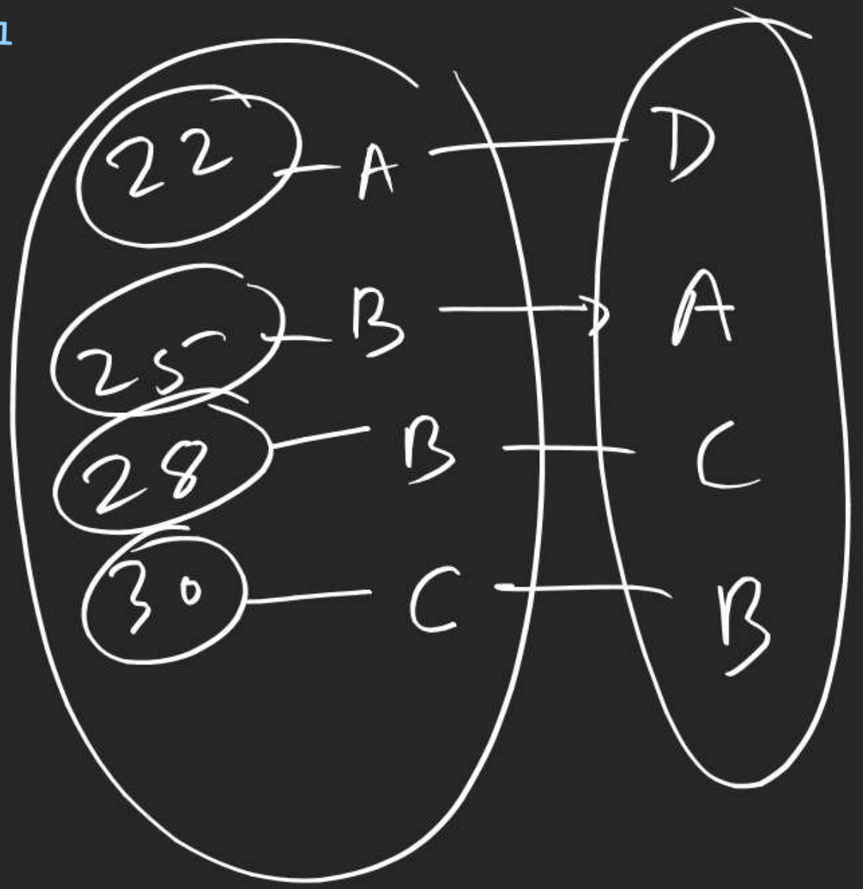
1, 3, 4, 7, 9, 10

11-16, 18

20-22, 24-30

O.V. $\rightarrow a/\sqrt{2}$

T.V $\longrightarrow a/2$



(28) (A) True

(B) True

(C) false

(D) True.

(30) $\sqrt{2}\, q = 4r$

$\sqrt{2} \times \frac{360^{90}}{4} = r$

(9)

$$6.17 = \frac{2 \times M/6\times10^{23}}{(3\omega \times 10^{-10})^3}$$

$$\frac{2\omega}{M}$$

$$M_{x_2} = 50$$

$$\text{no. of moles} = \frac{2\omega}{50} = 4 \text{ mol}$$

29.

A	B
$\frac{1}{8} \times 6$	3
$\frac{3}{4}$	3
3	3×4
1	4

Ans — C

(13) $r_B = 2r_A$ $\qquad a_2 = 1.5\, a_1$

Solid-1 $\qquad PF = 68 = \dfrac{2 \times 4/3\, \pi r_A^3}{a_1^3}$

$$PF = \frac{4/3\, \pi (r_A^3 + r_B^3)}{a_2^3}$$

Nishant Jindal

(10) $2.7 \times 10^3 \text{ kg/m}^3 = \dfrac{Z \times \dfrac{2.7 \times 10^{-2}}{N_A}}{(405 \times 10^{-12})^3}$

$Z = 4$ FCC $\sqrt{2}a = 4r$

$Z = 2$ BCC $\sqrt{3}a = 4r$

Na_2O str (Anti- Fluorite)

O^{2-} form FCC lattice — (4)

Na^+ occupy all T.V — (8)

$\sqrt{2}a = 4r_-$ $\left(\text{if } \frac{r_+}{r_-} = 0.225\right)$

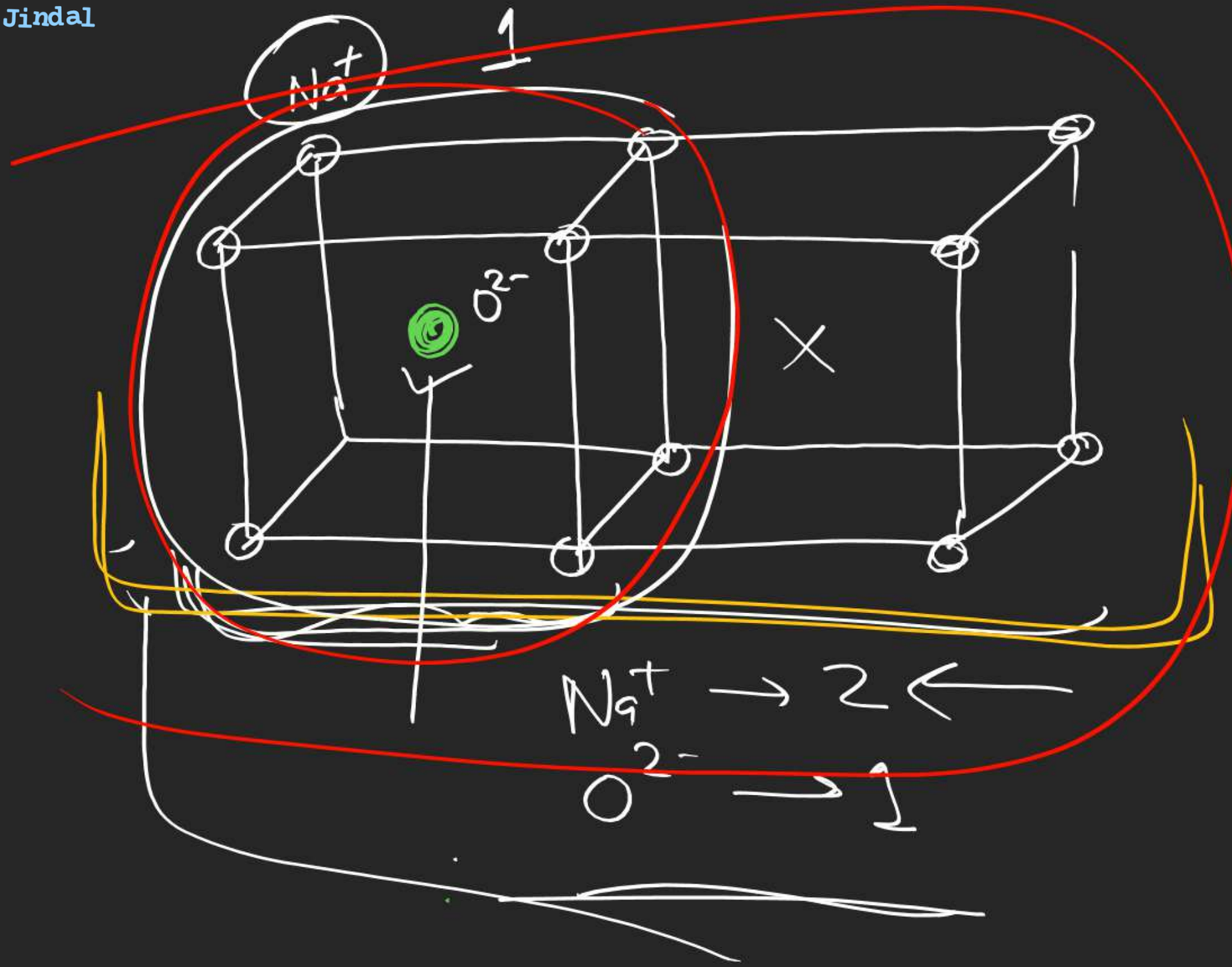
$\frac{\sqrt{3}a}{4} = r_+ + r_-$ (Always applicable)

O^{2-} are in Cubic void of Na^+

Co-ordination no of $Na^+ = 4$

$O^{2-} = 8$

Nishant Jindal



Defect X

J-Main

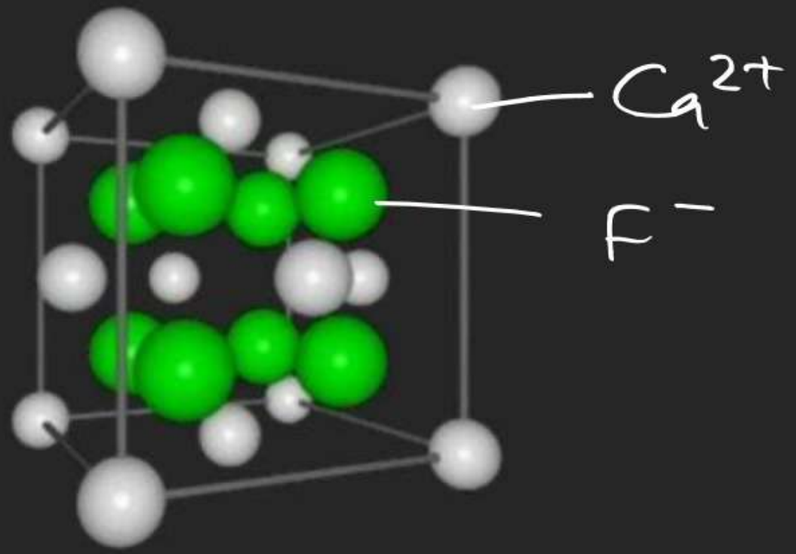
1, 3, 4, 7, 9, 10

11–16, 18

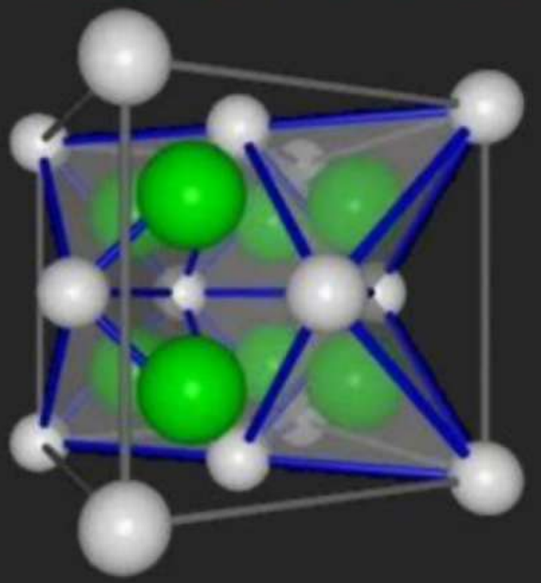
20–22, 24–30

Nishant Jindal

Fluorite str (CaF_2)



Fluoride Ions Occuy Tetrahedral Holes



→ Ca^{2+} form FCC lattice — 4

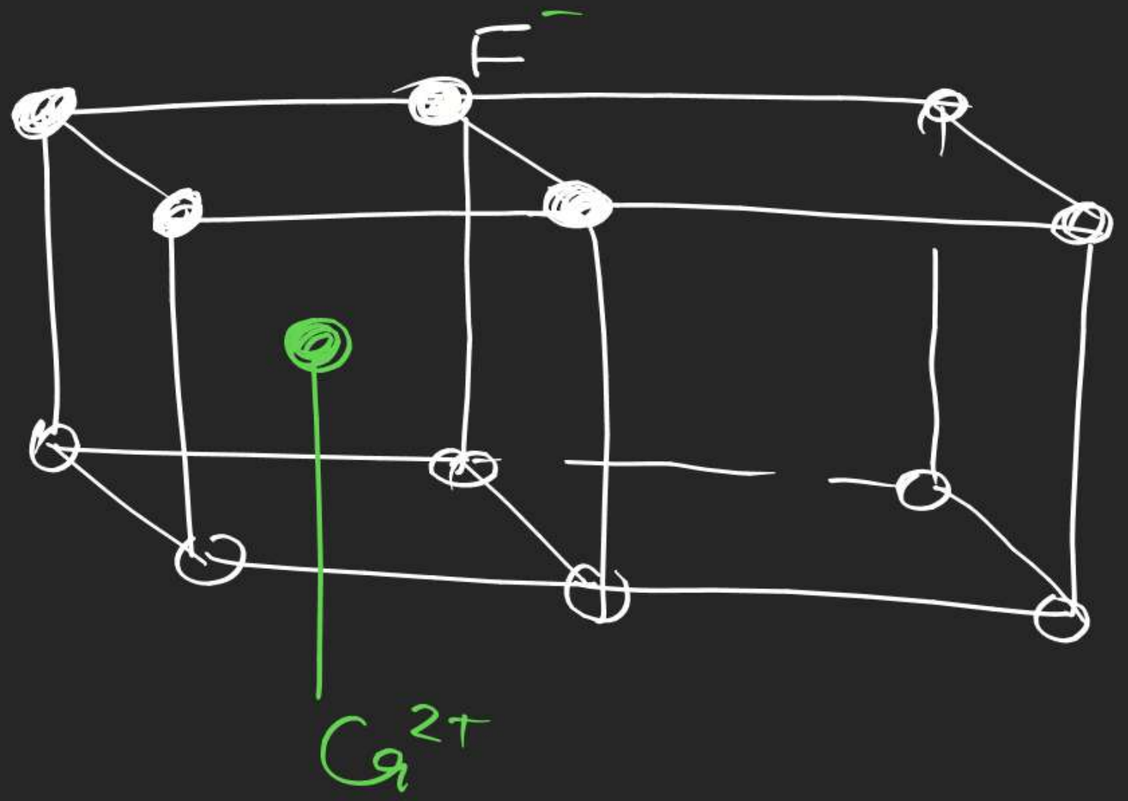
F^- occupy all T.V — 8

CaF_2

→ $\frac{\sqrt{3}a}{4} = r_+ + r_-$ (Always applicable)

$\sqrt{2}a = 4r_+$ (Never) — Ca^{2+} will not touch each other

→ Co-ordinati $qF^- = 4$ $Ca^{2+} = 8$ ← Cubic Void



If

$\frac{r_+}{r_-} = 0.732$

then F^- may touch other

CaF_2

$\longrightarrow Na_2O$ — $\frac{r_+}{r_-} = 0.225$

In Hexagonal Layers packing

no. of O.V in FCC = 4

" T.V " = 8

- no. of atom/Unit cell = 4

T.V = 2 X O.V

In HCP Prism no. of O.V = 6

T.V = 12

no of atoms per prism = 6

SOLID STATE

HCP

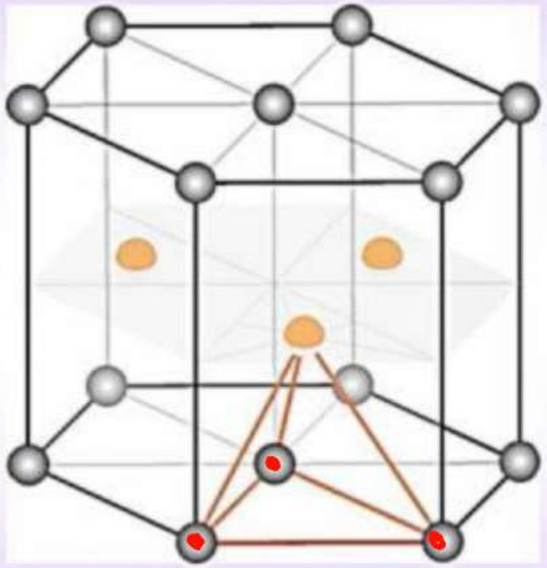
12

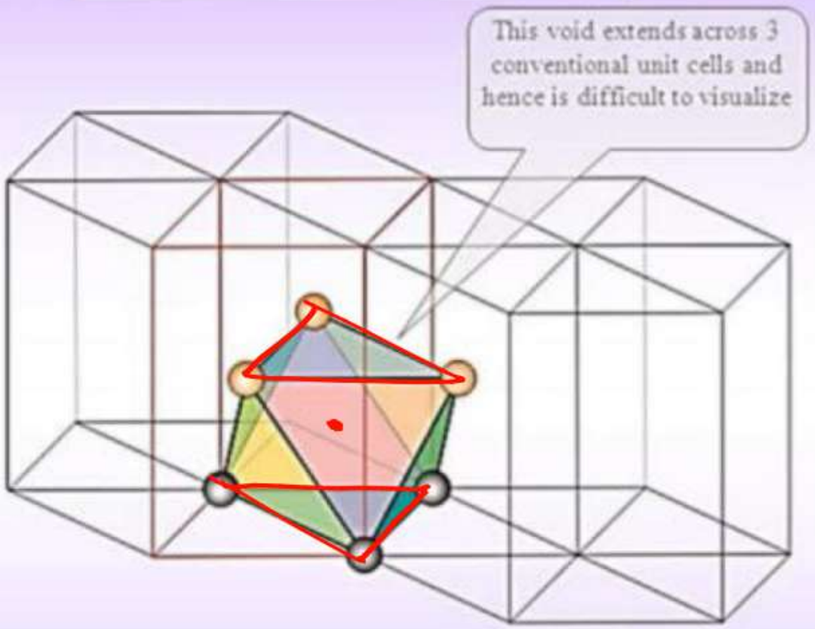
6 per prism

VOIDS

TETRAHEDRAL

OCTAHEDRAL





Coordinates: $(0,0,\frac{3}{8}),(0,0,\frac{5}{8}),(\frac{2}{3},\frac{1}{3},\frac{1}{8}),(\frac{2}{3},\frac{1}{3},\frac{7}{8})$

Coordinates: $(\frac{1}{3},\frac{2}{3},\frac{1}{4}),(\frac{1}{3},\frac{2}{3},\frac{3}{4})$

- These voids are identical to the ones found in FCC *(for ideal c/a ratio)*.
- When the c/a ratio is non-ideal then the octahedra and tetrahedra are distorted *(non-regular)*.

Important Note: often in these discussions an ideal c/a ratio will be assumed (without stating the same explicitly).
If c/a ratio is not the ideal one–then the voids will not be 'regular' (i.e. regular octahedron and regular tetrahedron).

SC → 8

BCC — 10

FCC — 10

HCP → 7-8

Radius ratio

NaCl —

ZnS — diamond

CsCl —

Na_2O —

CaF_2 —

Nishant Jindal

O - I	Upto 39
S - I	Upt 28
O - II	1 to 10

NCERT

Defect