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SOLID STATE

O-I Q.No 1

SiO_2

Diamond

→ AlN

SiC

C

Si

5

P_4, S_8 Molecular

5

Quartz

Quartz glass

Amorphous

6 D Ans

13 Hold

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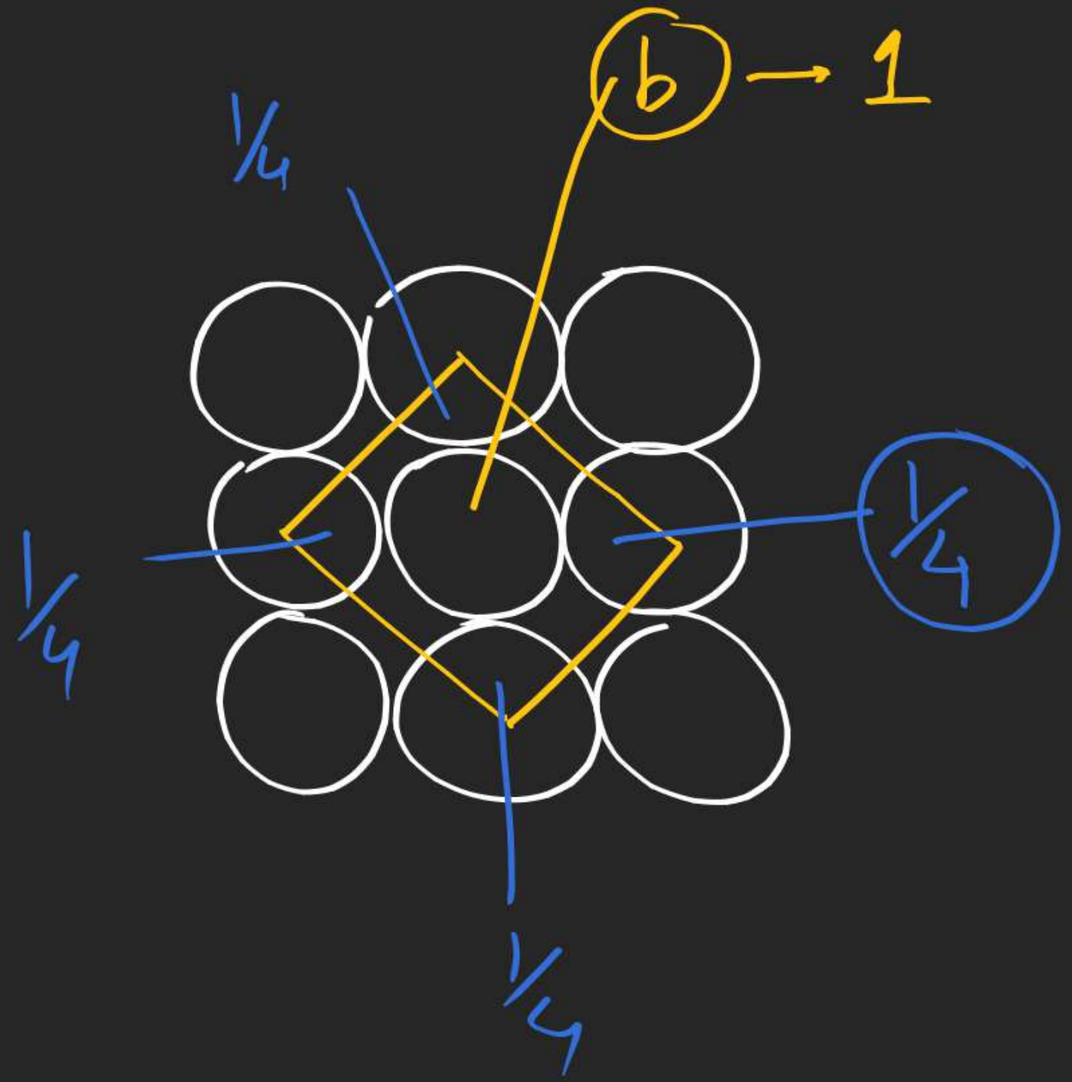

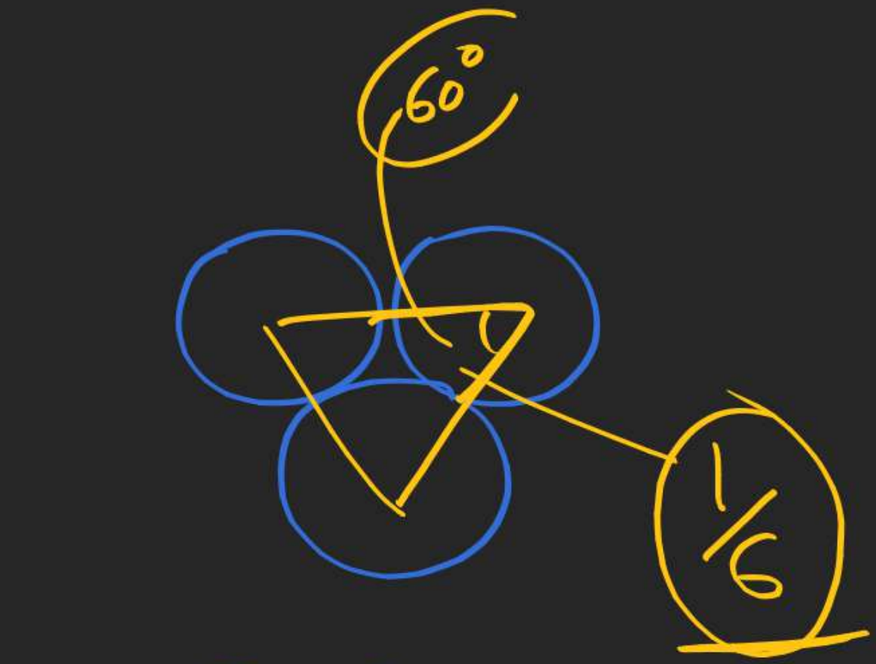

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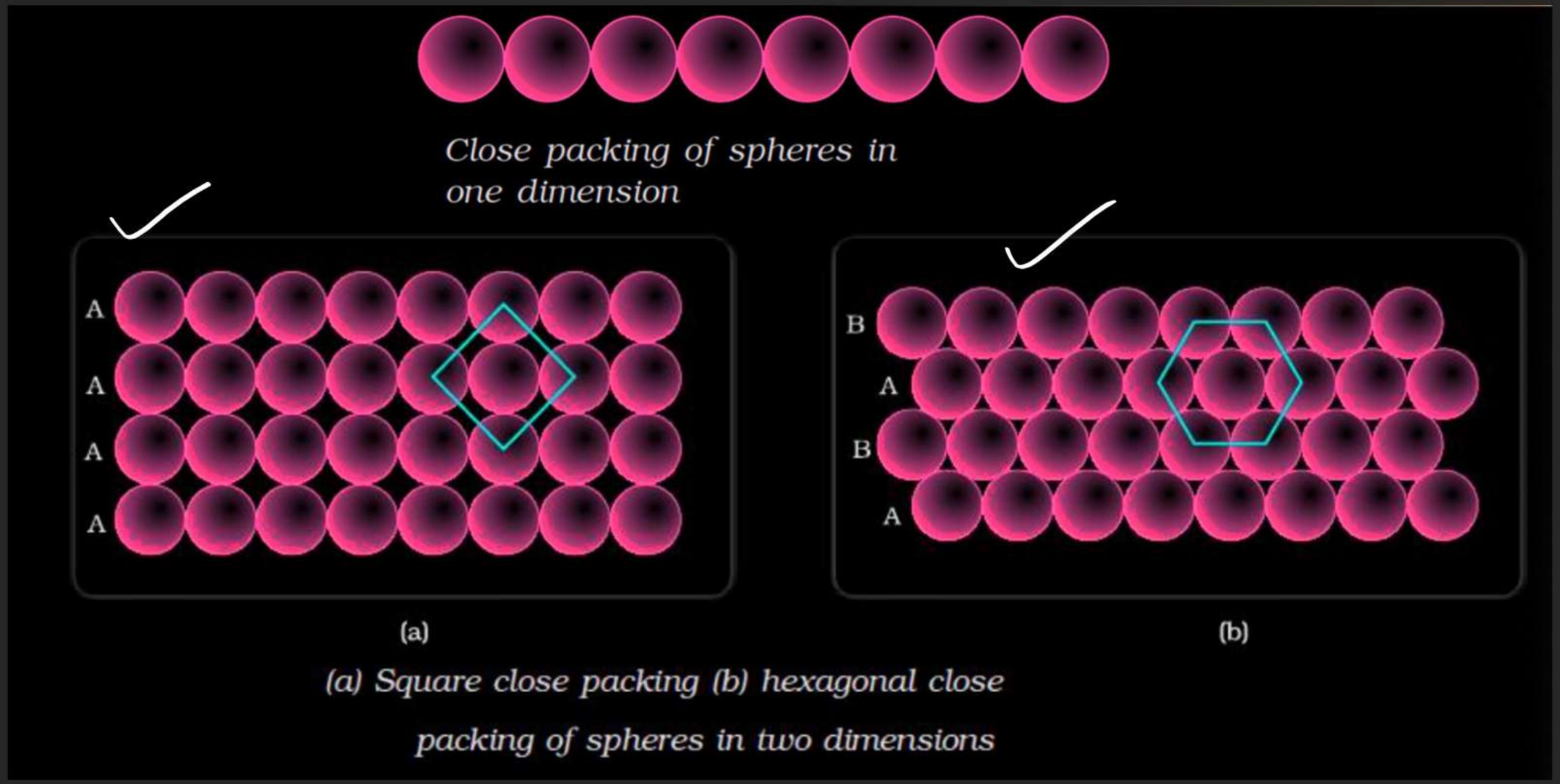

(a) Square close packing (b) hexagonal close packing of spheres in two dimensions

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Stacking

A 3

A 2

A 1

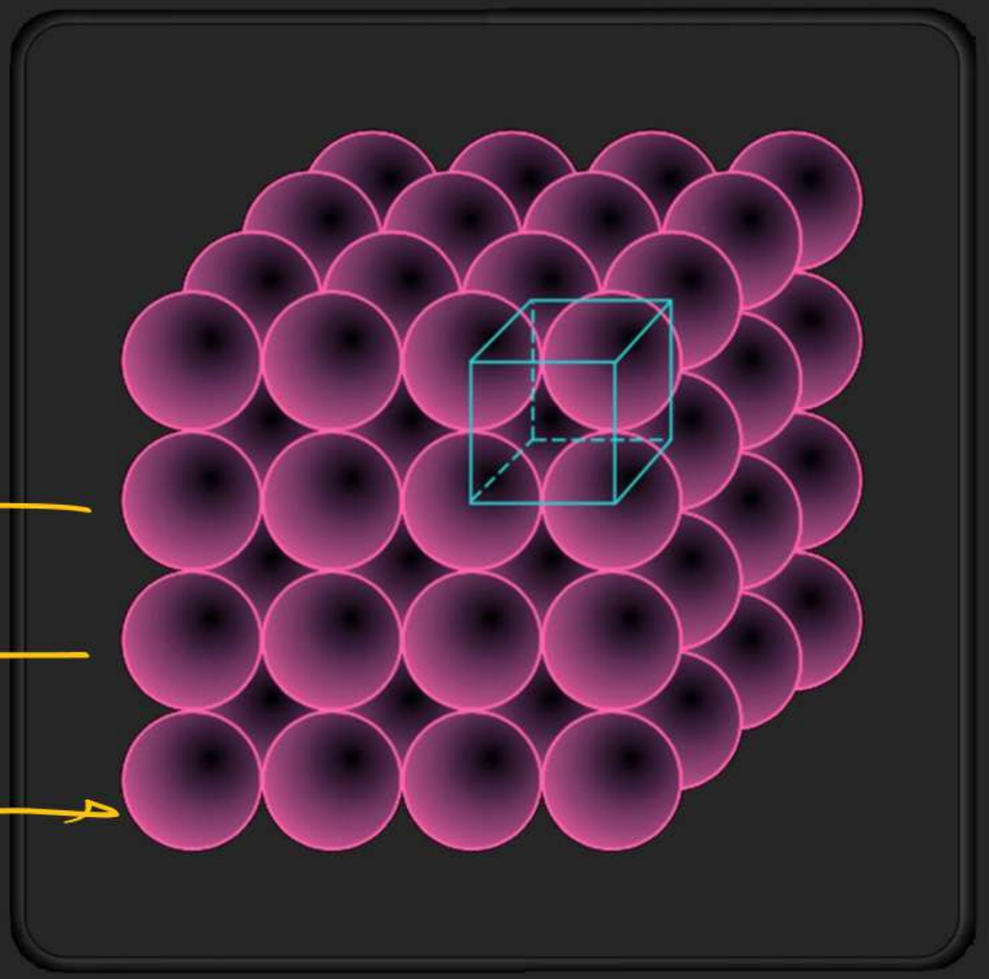

Fig. 1.19: Simple cubic lattice formed by A A A ... arrangement

Square close packing

Simple Cubic → AAAA

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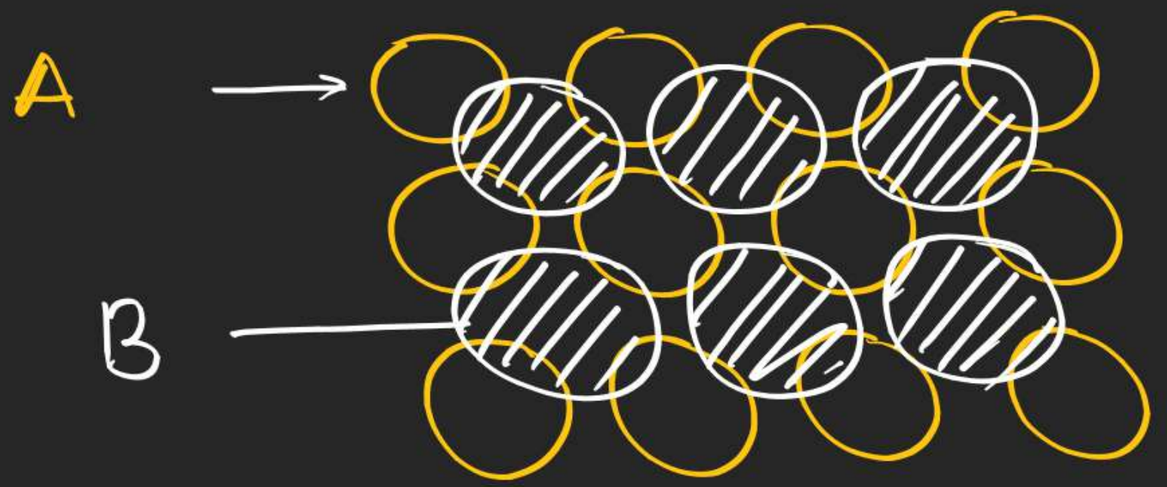
Square close packing



BCC ABAB

SC AAAA

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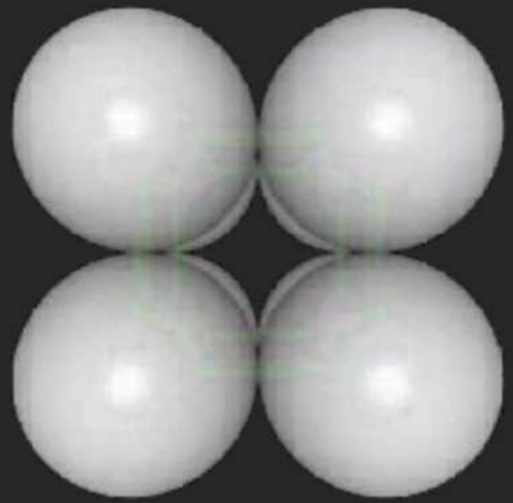

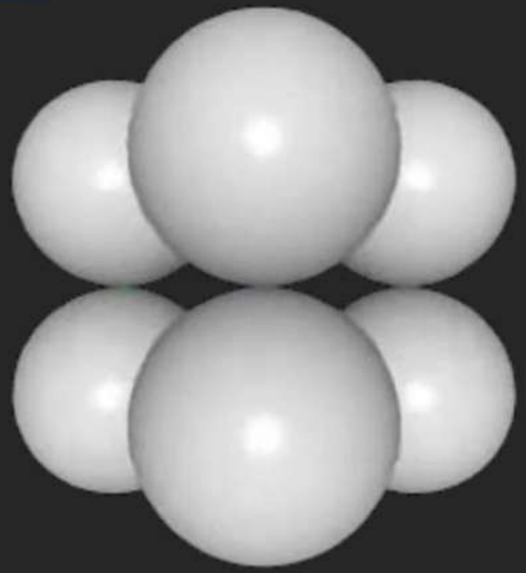

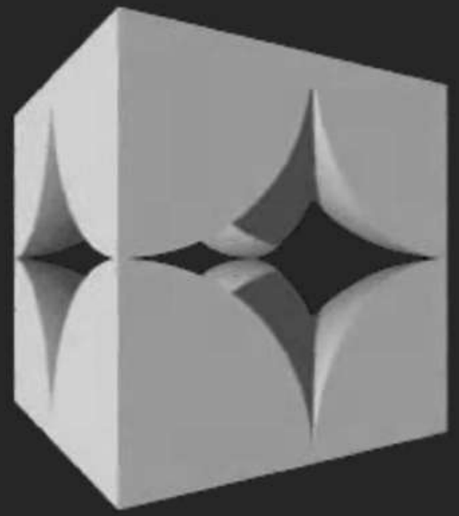

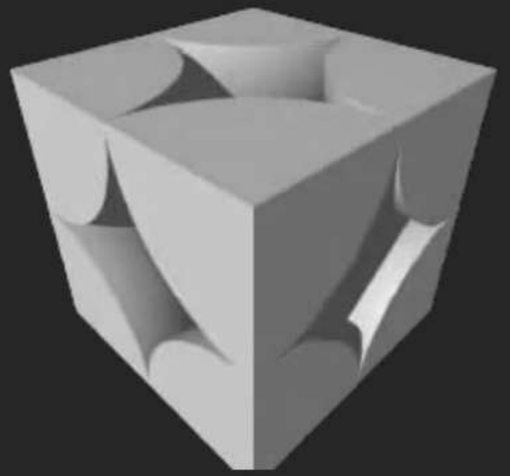

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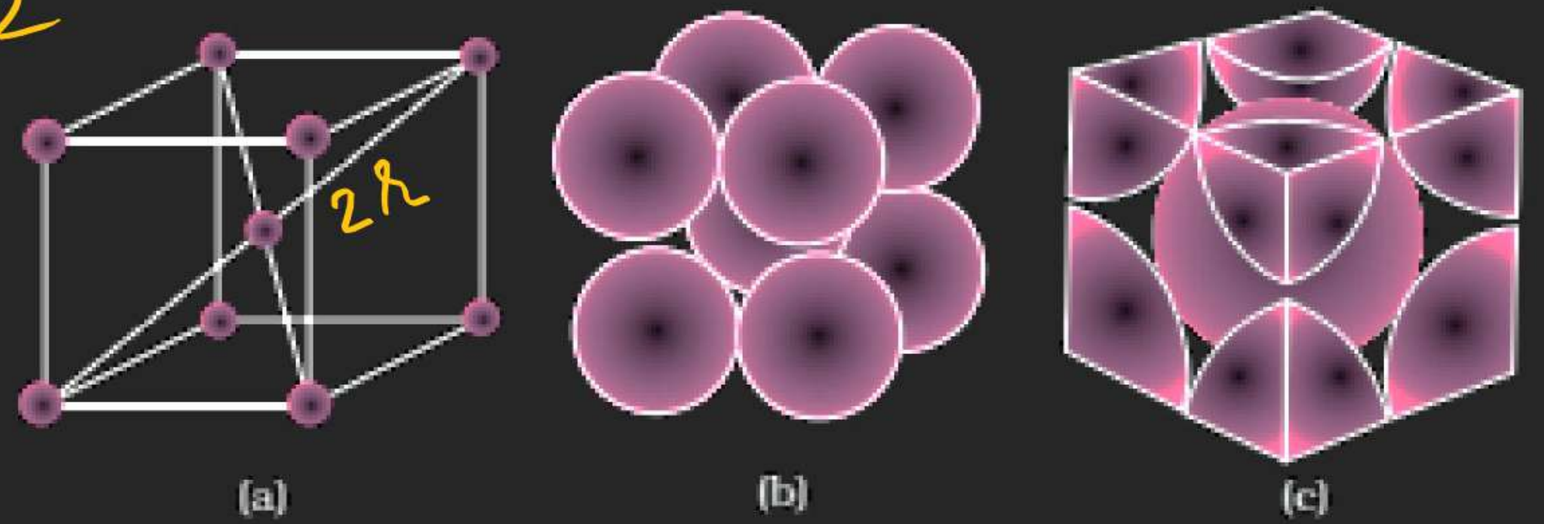
BCC

$\sqrt{3}a = 4R$

$\frac{\sqrt{3}a}{2} = 2R$



A primitive cubic unit cell (a) open structure (b) space-filling structure (c) actual portions of atoms belonging to one unit cell.

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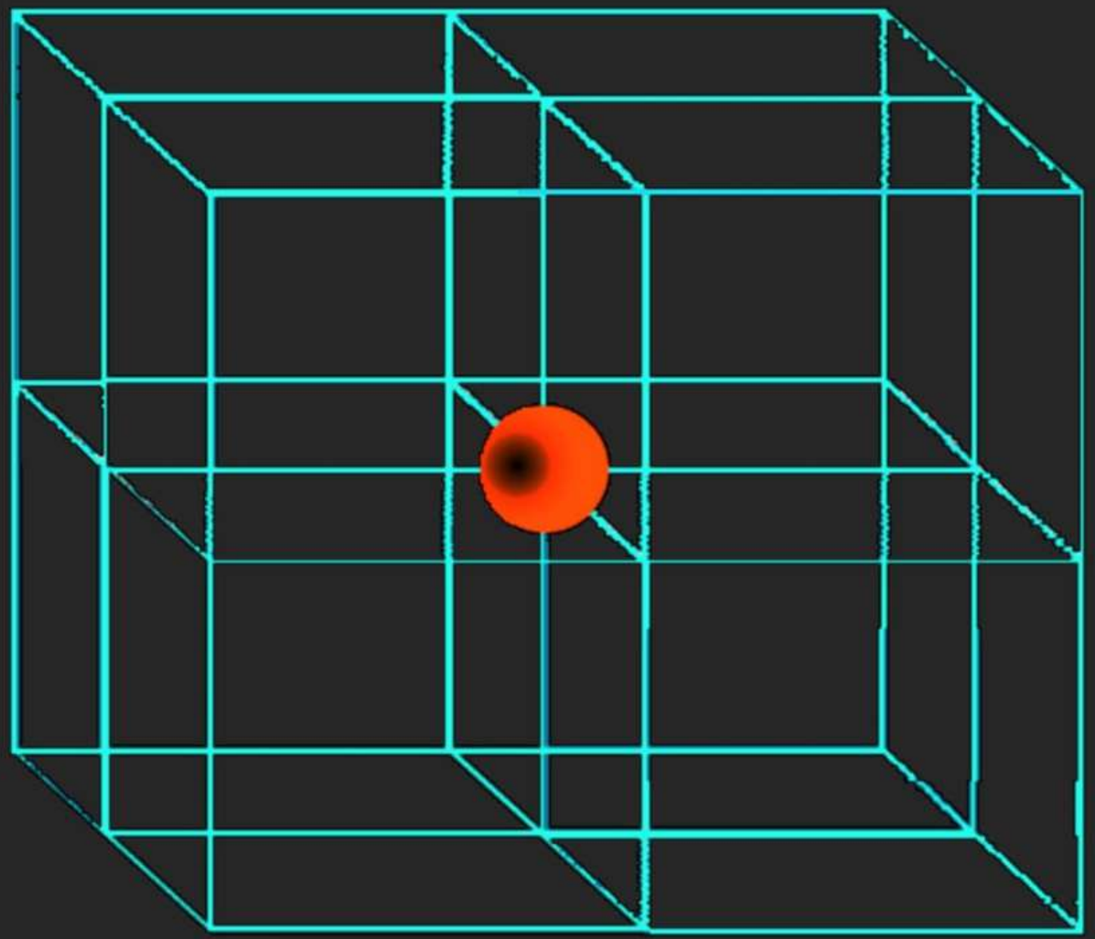

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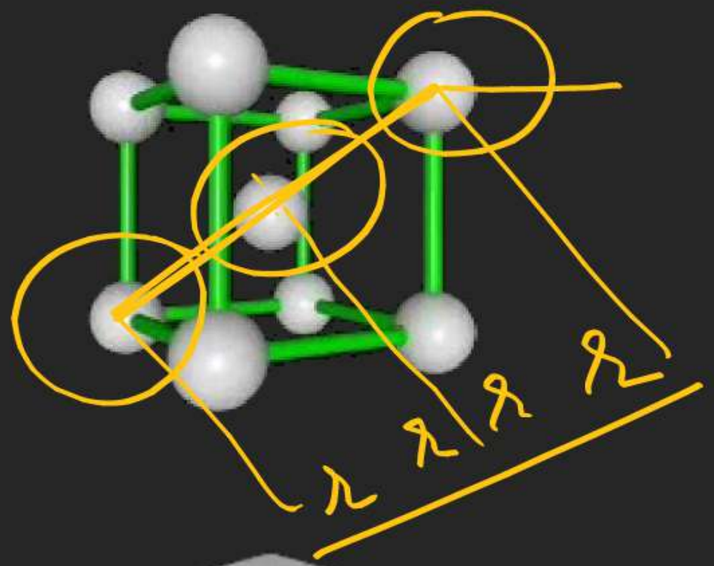
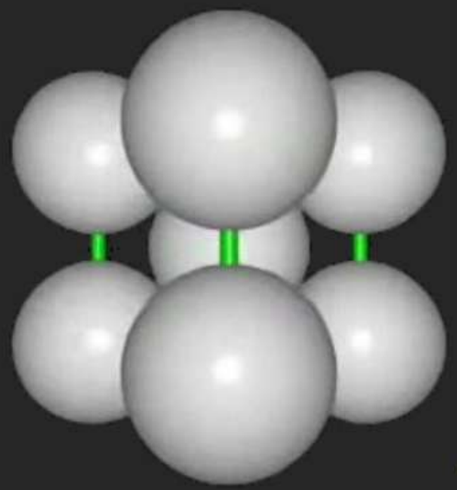
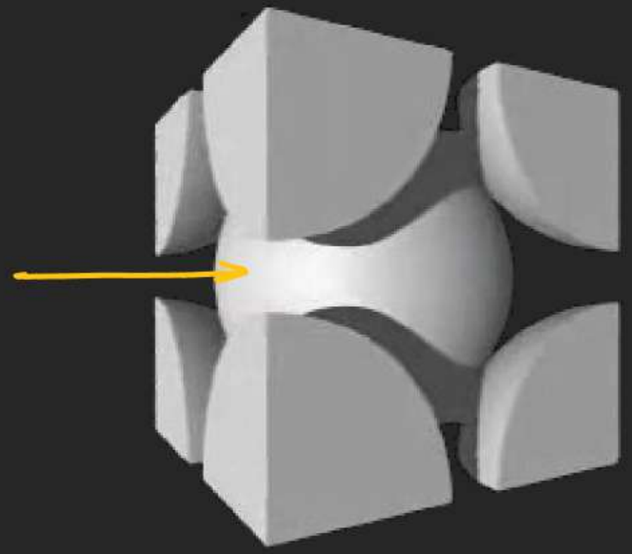




atom/Unit cell = 2

Co-ordination = 8

$\sqrt{3}a = 4r$



Packing efficiency

$$= \frac{2 \times \frac{4}{3}\pi r^3}{a^3} \times 100$$

$\simeq 68\%$

Distance of nearest atom from a given atom and no. of such atoms $\frac{\sqrt{3}a}{2}$, 8

Distance of 2nd " " " "

Ans a, 6

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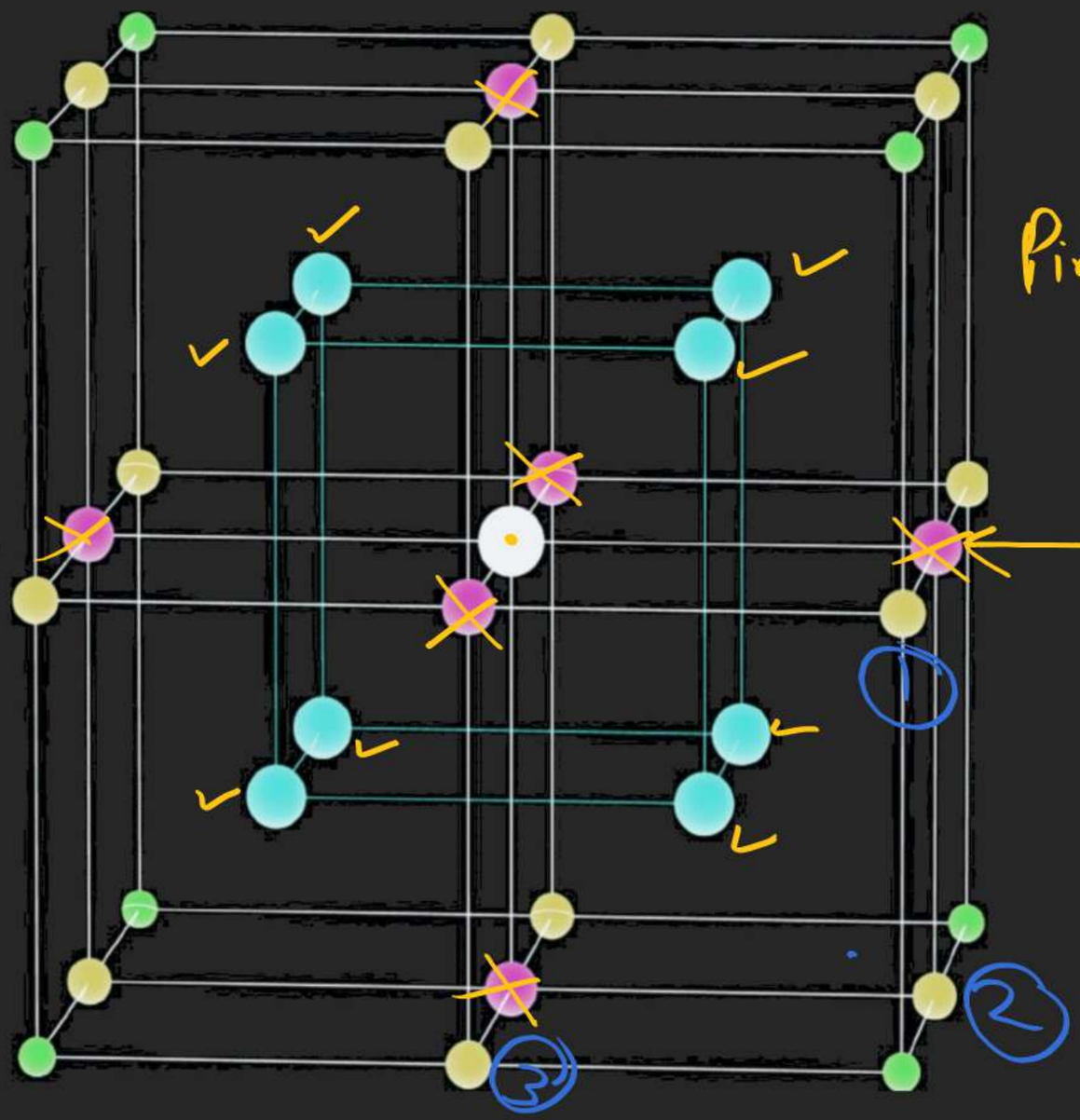

$\sqrt{3}a/2$

sky blue – Nearest

Pink or purple → 2nd nearest

@

$\sqrt{2}a$, 12

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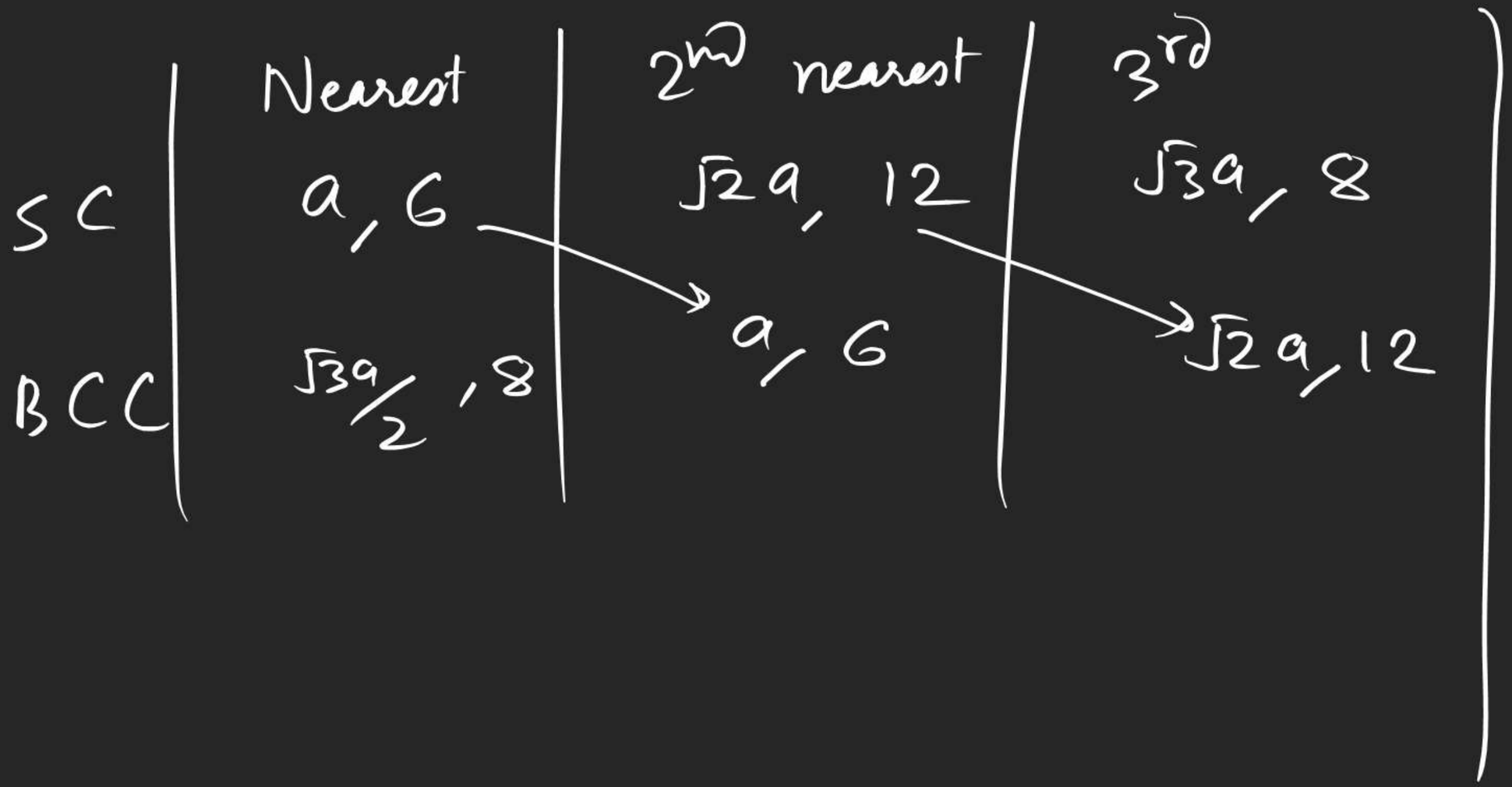

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Face centred Cubic Unit cell & Hexagonal Unit cell

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Simple Cubic (SC)

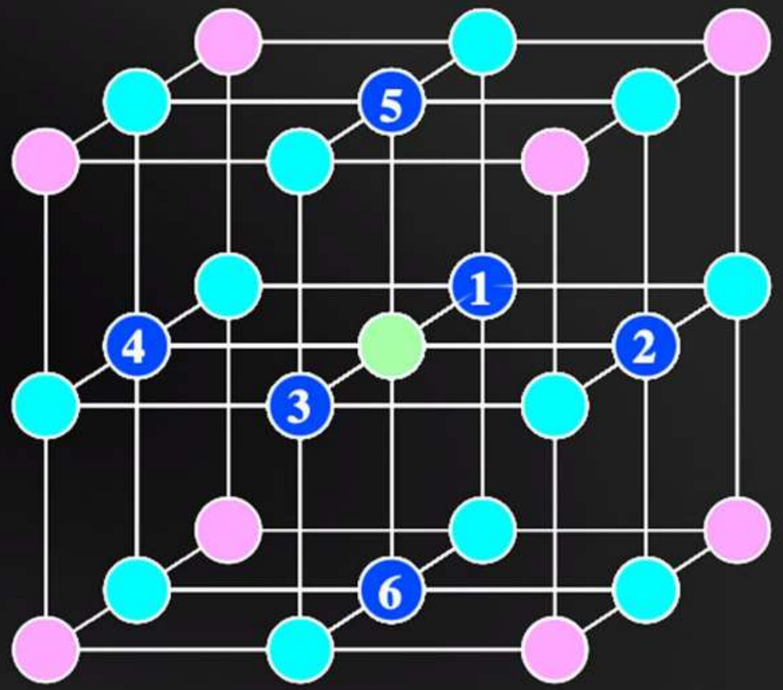
Coordination number: **6**

1, 2, 3, 4, 5, 6

Nearest neighbors (NN)

Next-nearest neighbors (NNN)

Next-next nearest neighbors (NNNN)



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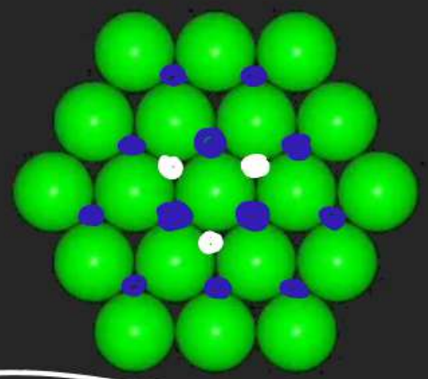
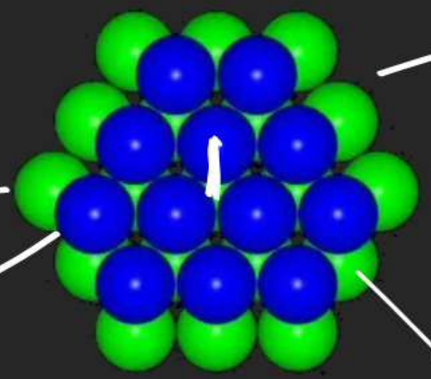
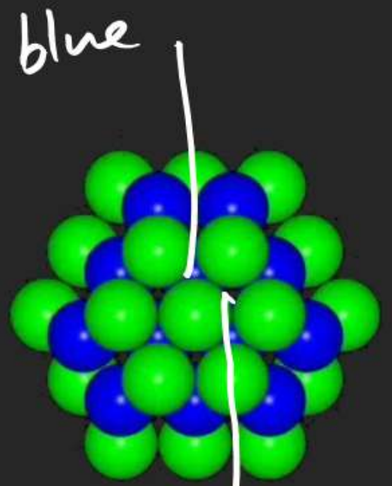
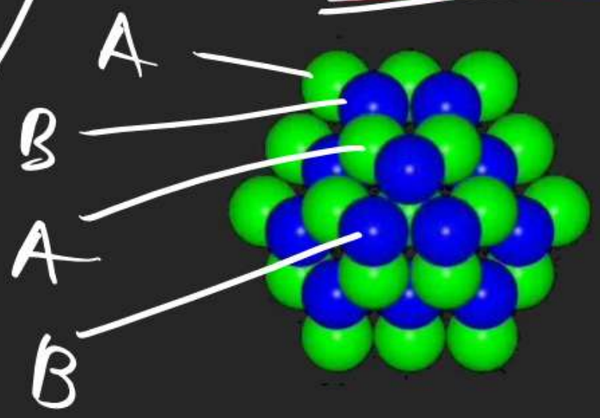


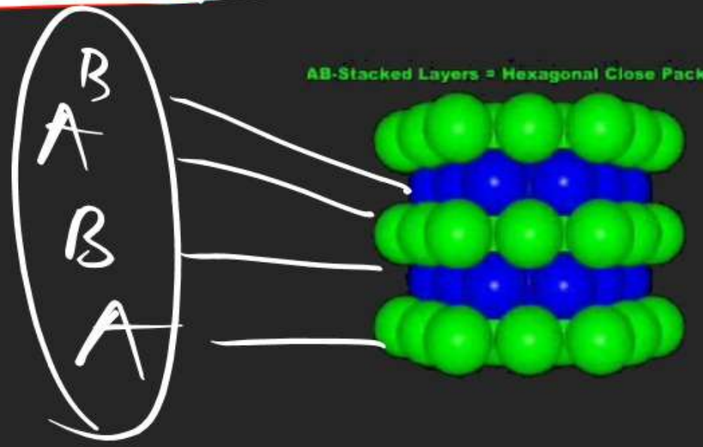




Hexagonal Unit cell

A B A B A B





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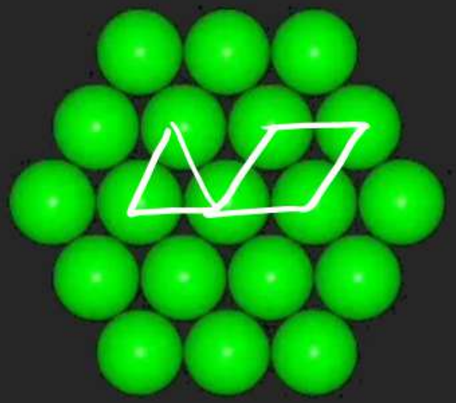
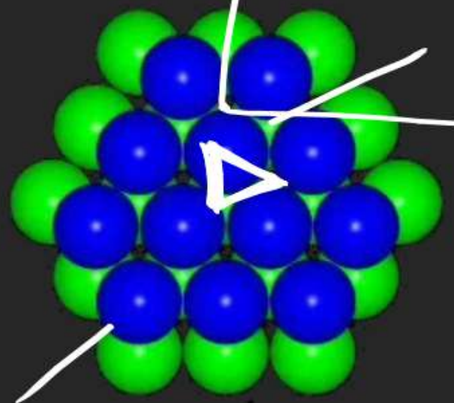
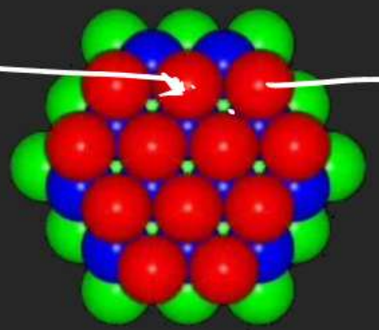


A



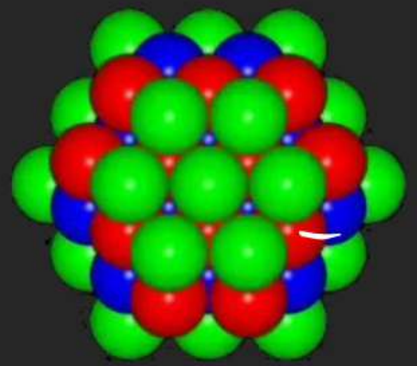
B

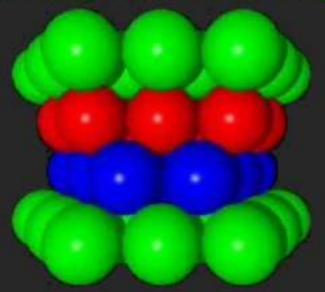


C

FCC → ABCABC

G





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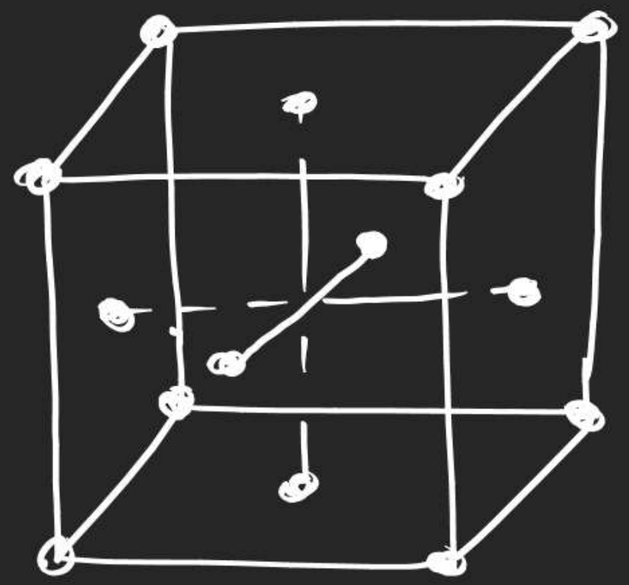
Face centred Cubic unit cell (FCC)



ABCABC

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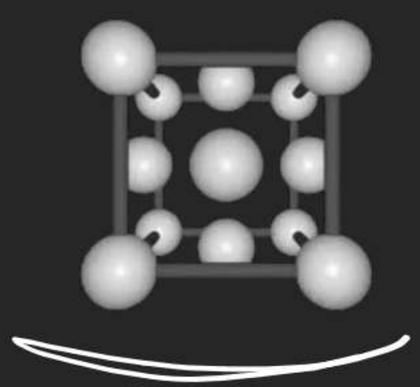
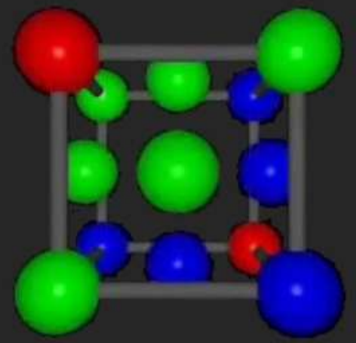
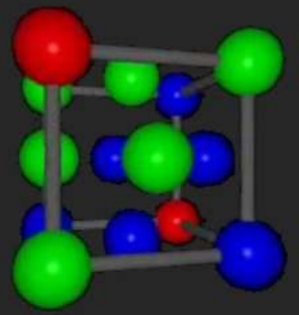
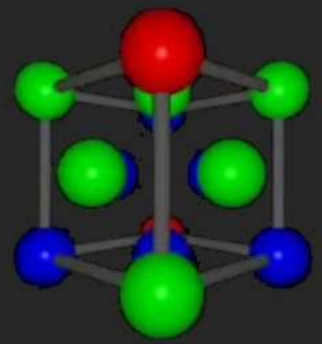
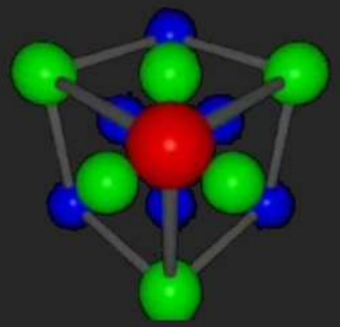
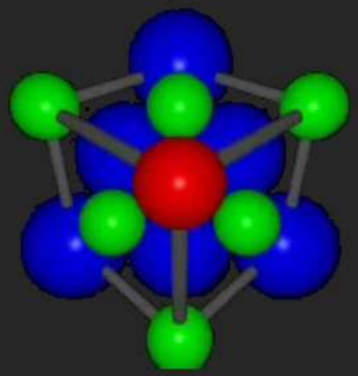










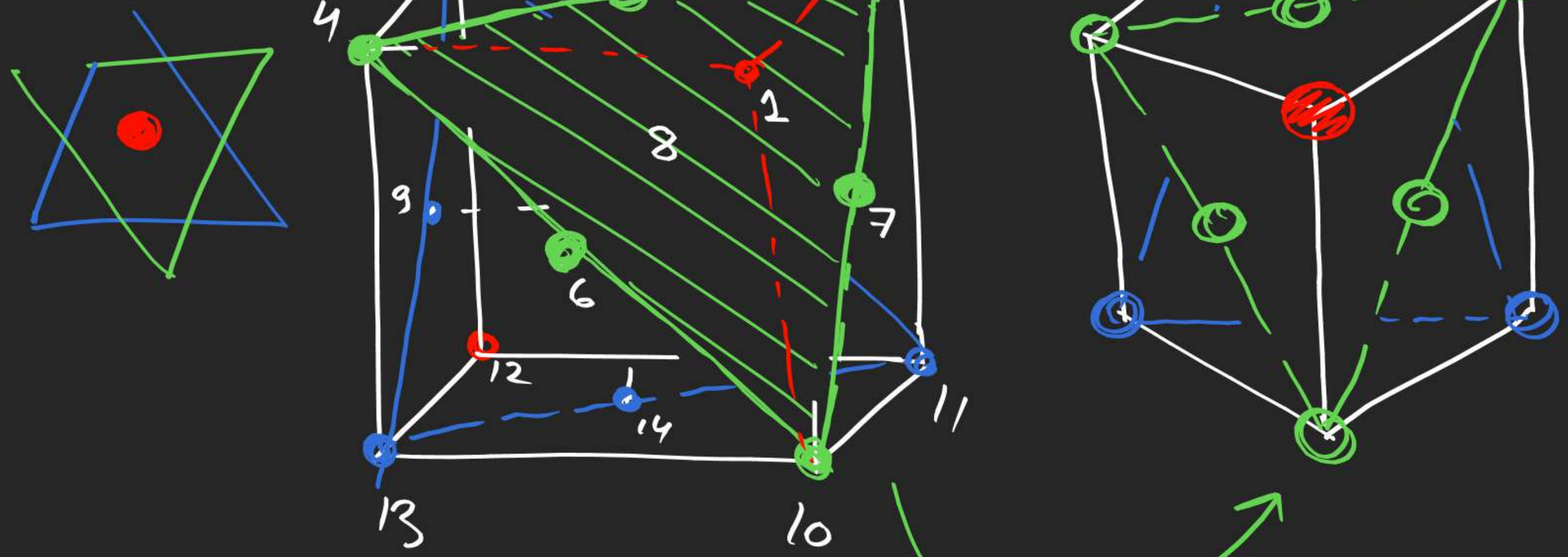


A — 1

B — 2, 5, 4, 6, 7, 10

C — 3, 9, 13, 14, 11, 8

A — 12



45° Turn, Tilt

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0-1 16-21