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IMPORTANT FORMULAE

All the Important Formulae that a student should know from....

XII Chemistry

CHAPTER 1 - THE SOLID STATE

1. Number of atoms in different unit cells:
   a. Primitive unit cell: 1 atom
   b. Face centred unit cell: 4 atoms
   c. Body centred unit cell: 2 atoms

2. Let the number of close packed spheres = N
   Number of octahedral voids generated = N
   Number of tetrahedral voids generated = 2N

3. Packing efficiency is the percentage of total space occupied by constituent particles (atoms, molecules or ions).

$$\text{Packing efficiency} = \frac{\text{Volume occupied by spheres in the unit cell}}{\text{Total volume of unit cell}} \times 100\%$$

   a. Packing efficiency for face centred cubic unit cell $= 74\%$
   b. Packing efficiency for body centred cubic unit cell $= 68\%$
   c. Packing efficiency for simple cubic unit cell $= 52.4\%$

4. Relationship between radius of constituent particle (r) and edge length(a):
   a. Simple cubic unit cell: a= 2r
   b. Face centred unit cell: $a = 2\sqrt{2}\,r$
   c. Body centred unit cell: $a = \dfrac{4r}{\sqrt{3}}$

5. Volume of a unit cell = (edge length)^3 = a^3
   a. Simple cubic unit cell: Volume= (2r)^3
   b. Face centred unit cell: $\text{Volume} = (2\sqrt{2}\,r)$
   c. Body centred unit cell: $\text{Volume} = (\dfrac{4r}{\sqrt{3}})$

6. Number of atoms in a unit cell (z):
   a. Simple cubic unit cell: z = 1
   b. Face centred unit cell: z = 4
   c. Body centred unit cell: z = 2

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7. Density of unit cell:

Density of unit cell $=\dfrac{zM}{a^3.N_A}$