📗 CHEMISTRY NOTEBOOK — SOLID STATE (Day 4)

Topic: SC, BCC, FCC — Unit Cell Details

🔵 1. Types of Cubic Unit Cells

a) Simple Cubic (SC)

- Atoms only at **8 corners**
- Contribution per corner = **1/8**

Effective atoms per unit cell:

$$N = 8 \times \frac{1}{8} = 1$$

Coordination number: 6

(Each corner atom touches 6 neighbours)

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b) Body-Centered Cubic (BCC)

- Atoms at **8 corners**
- 1 atom at **center of cube**

Effective atoms:

$$N = 8 \times \frac{1}{8} + 1 = 2$$

Coordination number: 8

(Body center touches all 8 corner atoms)

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c) Face-Centered Cubic (FCC)

- Atoms at **8 corners**
- 1 atom on **each of 6 faces**

Contribution per face = 1/2

Effective atoms:

$$N = 8 \times \frac{1}{8} + 6 \times \frac{1}{2} = 4$$

Coordination number: 12

🔵 2. How Atoms Touch

SC:

Atoms touch along the **edge**.

BCC:

Atoms touch along the **body diagonal**.

FCC:

Atoms touch along the **face diagonal**.

🔵 3. Coordination Number (Shortcut Table)

Lattice	CN
SC	6
BCC	8
FCC	12

Easy memory trick:
→ **6** → **8** → **12** (Increase as packing becomes denser)

🔵 4. Effective Number of Atoms (Shortcut Memory)

Lattice	Effective Atoms
SC	1
BCC	2

Memory trick:

SC = 1 (simple → single)

BCC = 2 (body → bonus atom)

FCC = 4 (faces → "four faces contribute")

🔵 5. Packing Efficiency (Concept only today)

(Not calculation today—just concept)

- **SC:** Lowest packing (~52%)
- **BCC:** Medium (~68%)
- **FCC:** Highest (~74%)

Higher packing → more closely packed → higher density.

🔵 6. Edge Length Relation (Concept only today)

Will do formulas later.

You must remember today:

- SC → touching along edge
- BCC → touching along body diagonal
- FCC → touching along face diagonal

Formulas will come tomorrow.

🔵 7. Board Exam Must-Write Points

- Diagrams of SC, BCC, FCC
- Number of atoms
- Coordination number
- Packing order: SC < BCC < FCC
- Unit cell definition
- Lattice vs basis (simple 2-line definition)

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