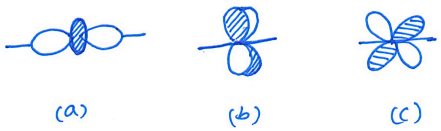
I. State the original Hohenberg–Kohn Theorem-1 (HKT-1) and prove it by the approach of contradiction.

II. Using the orbitals given below sketch schematic electronic band dispersion diagrams for each separately and depict the possible graphic solutions of the crystal orbitals for four unit cells at $k = 0$ and π/a. Consider an orbital per unit cell.



III. Determine d_{111} in tetragonal unit cell, a = 3.2 Å and c = 4.2 Å.

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