3.2. Quantum Point Contact

3.2a. The steps in the conductance versus $\mu$ of a ballistic 2D conductor (represented by a square lattice with $\alpha$ and $\beta$) occur when $\mu$ equals

(a) one of the eigenenergies of $[H]$

(b) (one of the eigenenergies of $\beta$) $\pm 2t$

(c) (one of the eigenenergies of $\alpha$) $\pm 2t$

(d) (one of the eigenenergies of $[H]$) $\pm 2t$

(e) one of the eigenenergies of $\alpha$

3.2b. For a 2D square lattice the matrices $\alpha$ and $\beta$ can always be diagonalized simultaneously because

(a) the matrix $\beta$ is always diagonal in every basis

(b) the matrix $\alpha$ is always diagonal in every basis

(c) the matrices $\alpha$ and $\beta$ are both always diagonal in every basis

(d) neither of the matrices $\alpha$ and $\beta$ is always diagonal, but we can find a basis that makes them both diagonal

(e) none of the above, the matrices $\alpha$ and $\beta$ cannot always be diagonalized simultaneously