
Photonic Crystals

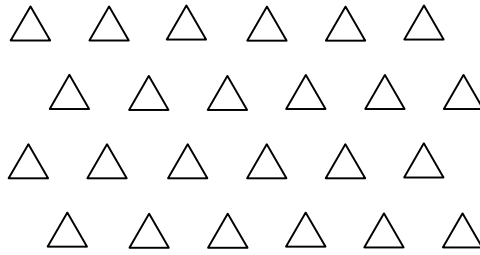
Comprehensive Exam

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Time: 1:20'

Use of references is allowed.

1. What is the symmetry point group of the following two-dimensional lattice? Show the Wigner-Seitz Cell, Basis Vectors, the First and the Irreducible Brillouin Zones.



2. Investigate that whether a two-dimensional lattice and its corresponding reciprocal lattice share identical symmetry groups or not.
3. The Local Density of States (LDOS) is defined as

$$\rho(\mathbf{r}; \omega) = -\frac{2\omega}{\pi^2} \text{Im}\{\text{tr}[\vec{G}(\mathbf{r}, \mathbf{r}; \omega)]\}$$

Verify the alternate definition of the Density of States (DOS) given by

$$D(\omega) = \frac{1}{V_{WSC}} \iiint_{V_{WSC}} \rho(\mathbf{r}; \omega) d^3r = \sum_{n\mathbf{k}} \delta[\omega - \omega_n(\mathbf{k})]$$

Provide all details of your calculations.