

HW #5

PHYSICS 406

(due 03/14/13)

Reading

- (1) Omar, Ch. 5 (Ch. 4 also used)
- (2) Handout 5: "Photonic crystals: semiconductors of light"

Problems

1. Omar (O) Ch. 4, Q. 5
2. Omar (O) Ch. 4, Q. 8
3. O Ch. 4, Q. 9
4. O Ch. 5, Q. 1
5. O Ch. 5, Q. 2
6. O Ch. 4, Pr. 10
7. O Ch. 5, Pr. 14
8. Kittel Pr. 6 (see below)

6. **Square lattice.** Consider a square lattice in two dimensions with the crystal potential

$$U(x,y) = -4U \cos(2\pi x/a) \cos(2\pi y/a)$$

Apply the central equation to find approximately the energy gap at the corner point $(\pi/a, \pi/a)$ of the Brillouin zone. It will suffice to solve a 2×2 determinantal equation.

9. Based on the information in Handout 5, please describe recent developments in the field of photonic crystals. Please use ≥ 4 sentences in your response.