

Applied Physics 114c: Homework #2

(Dated: April 8, 2016)

Due: Monday, April 25th (box outside Watson 264, anytime before midnight)

1. Reading

Chapter 32,33 in Ashcroft and Mermin (AM), Chapter 15 of Kittel (CT, 6th edition).

2. **(10 points)** Ch. 31 of AM, Problem #8

3. **(10 points)** Ch. 31 of AM, Problem #11

4. **(10 points)** Ch. 32 of AM, Problem #5

5. **(10 points) Magnon dispersion relation** This problem is taken from CT (6th edition; problem 1, chapter 15). Derive the magnon dispersion relation for a ferromagnetic cubic lattice with nearest neighbour interactions,

$$\hbar\omega = 2JS \left[z - \sum_{\mathbf{r}_i} \cos \mathbf{k} \cdot \mathbf{r}_i \right], \quad (1)$$

where the summation is over the z vectors denoted by \mathbf{r}_i which join the central atom to its nearest neighbours.