

Physics 140A-Introduction to Solid State Physics
Winter, 2016
Problem Set 3
Due Thursday, 18 February

Reading: Finish Omar, Chapter 2, Read Chapter 3 on Lattice Vibrations, Sections 3.1-3.10

Diffraction:

(Questions and Problems in Omar from Chapter 2 indicated as 2.x)

- [1] Question 2.1**
- [2] Question 2.2 (We discussed this in lecture.)**
- [3] Question 2.3**
- [4] Problem 2.3.**
- [5] Problem 2.6. A hint here is to let the vector s lie along the z direction in spherical polar coordinates, which simplifies the integration greatly.**
- [6] Problem 2.8 (Also discussed in lecture in more detail.)**
- [7] Problem 2.9. Hint: You can let the limit on the integral R go to infinity, since the hydrogen wave function dies off quickly in r due to the exponential in its charge density.**
- [8] Problem 2.13**
- [9] Problem 2.19, plus as an additional part show the Ewald construction for diffraction of 10.0 keV x-rays incident on this 2D crystal along the direction of the basis vector \vec{a} , and comment on whether any diffraction spots would be observed.**
- [10] Problem 2.20,**
 - (d) Reword as: A general formula for the Bragg angle for reflection from the above (210) planes.**
 - Plus additional special part as:**
 - (e) Show with one or more cross-sections and/or 3D sketches what the first Brillouin zone would look like for this unit cell.**
- [11] Problem 2.25**