

Possible Phonon Problems for Midterm Exam: Solid State Physics 476
Oct. 23, 2006

1. Just like the 2004 midterm, sketch and give the dispersion relation for a 1-D chain of atoms.
2. If the atoms increase in mass does the speed of sound go up or down?
3. Show that for small K the phonons are non-dispersive and calculate the sound velocity.
4. Give the equation of motion for atom s as a result of its interactions with atoms $s - 1$ and $s + 1$.
5. Which has a higher group velocity, waves near the zone centre or near the zone edge? What is the relationship between group velocity at the zone edge and the Laue conditions for scattering?
6. How many distinct phonon modes are there? How widely spaced are they in K ?
7. What are some typical phonon wavelengths, frequencies, and energies?