

Condensed Matter Physics Homework Assignment 6

Due date Friday, October 15

1. Find the speed of sound waves propagating along the direction (110) in a cubic crystal with elastic moduli C_{11} , C_{12} , and C_{44} .
2. Fluids, being rotationally symmetric, can be characterized by 3 elastic moduli C_{11} , C_{12} , and C_{44} . Unlike crystals, fluids are indifferent to their shape. In the language of elasticity theory, it means, for instance, that creating a static shear strain in a fluid is not accompanied by static stresses; hence $C_{44} = 0$. Relate the remaining elastic moduli of a fluid, C_{11} and C_{12} , to each other and to the bulk modulus B . Compute the velocities of sound waves and comment on the differences (if any) with sound waves in crystals.

Assigned reading: Chapters 22 and 23 in *Ashcroft and Mermin*.