

## Homework # 3; due Wednesday, March 2

7. A diamond sample contains one part per million (1 ppm) of substitutional nitrogen. What is the number density of nitrogen in this material?
8.
  - a. Estimate the thickness of diamond it would take to stop electrons with initial energy of 3 MeV.
  - b. Using the data in the lecture notes, estimate how many vacancies are created per 1 mm of travel of a relativistic electron in diamond.
  - c. Estimate how much energy a relativistic electron needs to deposit in diamond to knock out one carbon atom (i.e., to create one vacancy).
9. This problem refers to the fourth edition of Atkins and Friedman, Molecular QM.
  - a. It seems to me there are misprints in Table 5.4 (in the matrices for rotations). Please check and correct as needed.
  - b. Moreover, it appears that this set of matrices does not satisfy the Great Orthogonality Theorem (GOT) as formulated, see for example, the sum for the 34 location. Any ideas why?