Mock equation test chapters 1-3

1. Give the relation that expresses the reciprocal lattice vector $\mathbf{b_1}$ in terms of the crystal lattice vectors, $\mathbf{a_1}$, $\mathbf{a_2}$, and $\mathbf{a_3}$.

2. Give the diffraction condition in terms of **k'**, **k**, and **G** where **G** is equal to a particular reciprocal lattice vector.

3. Give an expression for the structure factor S_G in terms of the electron density n(**r**) and **G**.

4. Give an expression for the atomic form factor f_j in terms of the electron density $n_j(r)$ and G if the electron concentration is spherically symmetric about the origin.

5. Give an expression for the Lennard Jones potential between two atoms that interact according to VW interaction.

6. Give an expression for the interaction energy between two ions I and j in an ionic crystal.

7. Give the relations between the normal strain components, e_{xx}, e_{yy}, e_{zz} and the components of the displacement vector, i.e. u(**r**), v(**r**) and w(**r**) .

8. Give the relations between the shear strain components, e_{xy}, e_{yz}, e_{zx} and the components of the displacement vector, i.e. u(**r**), v(**r**) and w(**r**) .

9. Give a relation between the fractional increase of volume associated with a deformation, i.e. the dilation, and the normal strain components.

10. For a cubic crystal how many elements of the elastic stiffness matrix are unique, and which one?

11. Give the wave equation for a cubic crystal for a displacement in the u direction.

12. For a cubic crystal give the expression for the speed of a longitudinal wave in the [100] direction in terms of density and elastic stiffness constant.

13. For a cubic crystal give the expression for the speed of a transverse wave in the [100] direction in terms of density and elastic stiffness constant.