Assignment 1 : Basics of Neutron Scattering

1. Define a thermal neutron. What are the properties of a thermal neutron that makes it attractive for studying condensed matter?

2. What are the sources of thermal neutrons?

3. Given the temperature of a moderator 330 K, where will the Maxwellian distribution for the thermal neutrons peak?

4. What is the justification for a nuclear potential to be a δ-function?

5. What do you understand by form factor in x-ray diffraction. Does it have a counterpart in neutron diffraction?

6. Define coherent and incoherent scattering length for thermal neutrons. What is the origin of coherent and incoherent scattering lengths in thermal neutrons?

7. For hydrogen b^+ is 1.04×10^{-14} m and b^- is -4.74×10^{-14} m (symbols with usual meaning) calculate σ_{coh} and σ_{incoh} for hydrogen.

8. What is the effect of temperature on the diffraction pattern with respect to a rigid lattice at 0 K.

9. Can we get an estimate of strain from a neutron diffraction pattern?

10. Do you anticipate any order in a liquid or in an amorphous solid or a glassy material?

Give brief answers