

22.54 Neutron Interactions and Applications
(spring 2002)

Prpblem Sets #3

Due: Mar. 7, 2002

Problem 1

In a brief essay answer concisely the following questions.

- (a) What is the Fermi pseudopotential in thermal neutron scattering?
- (b) What is the physical reason that this simplified representation of neutron-nucleus interaction is reasonable?
- (c) Why is it so useful in developing the theory of thermal neutron scattering?

Problem 2

Explain as simply as you can what is meant by coherent and incoherent scattering in terms of direct and interference scattering. What are the sources of incoherence? Discuss the coherent and incoherent scattering cross sections of hydrogen and deuterium, and comment on their comparison.

Problem 3

Discuss the various features of the cross section shown in Fig. 2-9 in the 22.111 Lecture Notes, Chap VI with help from the discussions given in 22.113 Lecture Notes, Chap IX. Deduce the interatomic plane spacing in graphite from the indicated Bragg cutoff.