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1. The spacing of one set of crystal planes in common salt is d=0 .282 nm. A monochromatic beam of X ray produces a Bragg maximum when its glancing angle with these planes is 7°. Assuming that this is the first order maximum, (n=1) find the wavelength of the X rays. What is the minimum possible accelerating voltage that produces the X rays?

2. A beam of X rays is scattered by target at 45 degree from the beam direction. The scattered X rays have a wavelength of 2.2 pm. What is the wavelength of the X rays in the direct beam?

3. A positron with kinetic energy 2MeV collides with an electron at rest and the two particles are annihilated. Two photons are produced one moves in the same direction as the incoming positron and the other moves in the opposite direction. Find the energies of the photons.

4. Compton showed that individual photon carries momentum as well as energy. This momentum manifests itself in the radiation pressure felt by bodies exposed to bright light. Consider a 100 W beam of light shining for 1000 second on a 1-g black body, initially at rest in a frictionless environment. Calculate the total energy and momentum of the photons absorbed by the black body. Use conservation of momentum to find the body's final velocity. Calculate the body's final kinetic energy. Explain how this can be less than the original energy of the photons.