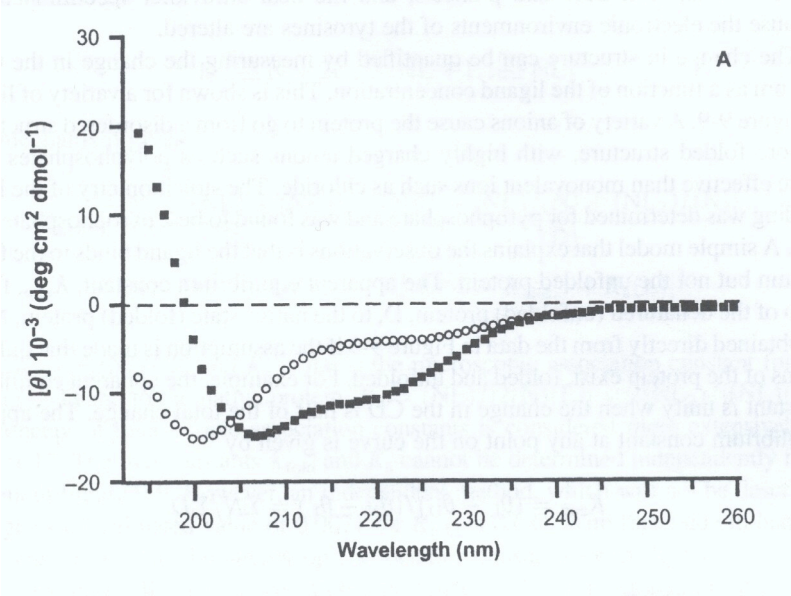
1) A crystal mounted on a diffractometer 150mm away from the detector is exposed to X-rays of wavelength 1.54Å. A reflection is located at 15.4mm from the location of the direct beam. Assume n=1. **A)** What is the lattice spacing along this axis? **B)** Is this spacing compatible with a large protein that has a radius of 30Å? Explain your reasoning.
tan(2θ)=15.4/150 to get θ
Bragg's law to 2dsin θ=nλ to determine d
d=15Å so a protein with radius of 30Å will not fit.

2) Circular dichroism of a protein measured in the presence (black squares) and absence (open circles) of a small compound is shown below. Explain what is happening upon binding of the small compound. NOTE: the small compound is not optically active



The protein undergoes a transition from mostly random coil to alpha helical upon binding of a small molecule.

3A) Describe the lattice type and symmetry axes for each of the following
a) $P2_1$ Primitive lattice (molecules on every corner) with two fold screw axis along Y and translations along X and Z
b) I422 Body centered lattice (molecules on every corner and in the middle of the Unit cell) with a four-fold axis on X and two-fold axes along Y and Z
c) C222 C center lattice (molecules on every corner and in the middle of two opposite sides) with two fold axes along X, Y, and Z

3B) Give the short abbreviations for the following types of lattices
d) A lattice with molecules on every corner and every face with two fold axes of rotation on every axis. F222

e) A lattice that has molecules ONLY at every corner, 4 fold screw axis with a ¾ unit cell translation along X, a two fold screw axis along Y, and a two fold axis along Z. $P4_32_12$