A compound of two elements crystallises in a crystal structure such that the atoms of type A are located at relative positions in the conventional cubic unit cell of $(0, 0, 0)$; $(0, \frac{1}{2}, \frac{1}{2})$; $(\frac{1}{2}, 0, \frac{1}{2})$ and $(\frac{1}{2}, \frac{1}{2}, 0)$, and of type B are located at $(\frac{1}{4}, \frac{1}{4}, \frac{1}{4})$; $(\frac{1}{4}, \frac{3}{4}, \frac{3}{4})$; $(\frac{3}{4}, \frac{1}{4}, \frac{3}{4})$ and $(\frac{3}{4}, \frac{3}{4}, \frac{1}{4})$. What type of crystal lattice does this material have and what is the basis that needs to be used to generate the crystal structure. How is the primitive unit cell different from the conventional cubic unit cell above?

One of the elements is hydrogen and the other comes from much lower down in the periodic table. Explain why this might allow you to simplify the calculations needed to predict the X-ray diffraction pattern from this compound. Use this simplified approach to calculate the Miller indices of the three Bragg scattering peaks which you expect to be strongest.

A second compound with the same lattice constant is composed of Indium and Antimony as the type A and type B atoms. Indium and Antimony are both from the same row in the periodic table. One of the first three peaks is found to be much weaker than the other two. Explain why this occurs and calculate which peak is the weakest.