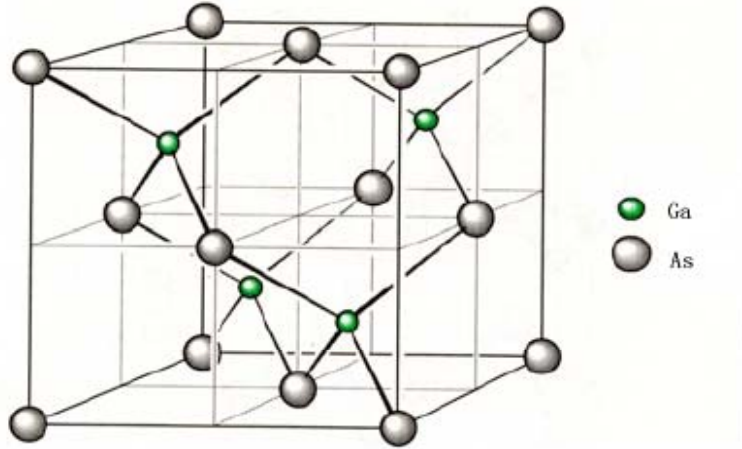


Problem 1

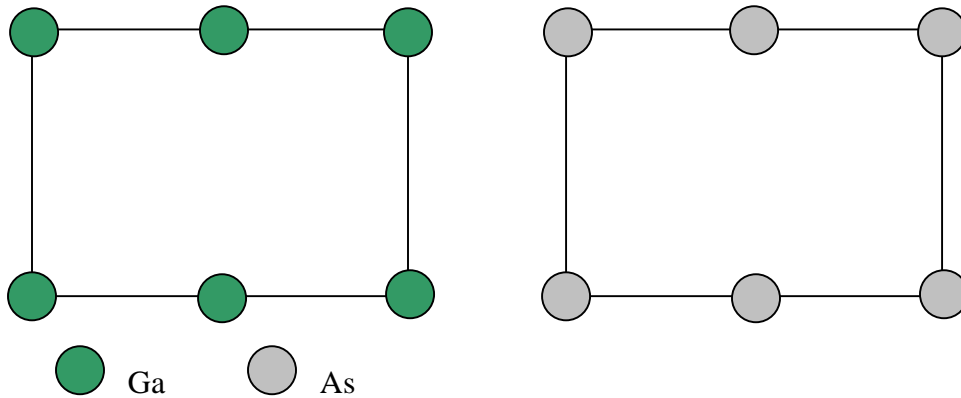
I have already added 4 points for those students who didn't measure a , b and γ

Problem 4

(c) A unit cell of GaAs is shown as the following



Suppose the coordinates of As atoms are (000) $(\frac{1}{2} \frac{1}{2} 0)$ $(\frac{1}{2} 0 \frac{1}{2})$ and $(0 \frac{1}{2} \frac{1}{2})$. Those of Ga atoms are $(\frac{1}{4} \frac{1}{4} \frac{1}{4})$, $(\frac{3}{4} \frac{3}{4} \frac{1}{4})$, $(\frac{3}{4} \frac{1}{4} \frac{3}{4})$ and $(\frac{1}{4} \frac{3}{4} \frac{3}{4})$ correspondingly. There are two possible configurations in a (110) plane of the GaAs structure.



We can only draw six atoms for each configuration, i.e. there are only As or Ga atoms in each case. Consider As (110) plane. The coordinates are given as (100) , $(\frac{1}{2} \frac{1}{2} 0)$, (010) , (101) , $(\frac{1}{2} \frac{1}{2} 1)$ and (011) . This plane can be written as $x+y=1$. **It is very clear that Ga atoms, which have coordinates as $(\frac{1}{4} \frac{1}{4} \frac{1}{4})$, $(\frac{3}{4} \frac{3}{4} \frac{1}{4})$, $(\frac{3}{4} \frac{1}{4} \frac{3}{4})$ or $(\frac{1}{4} \frac{3}{4} \frac{3}{4})$, can't occupy As (110) plane, and vice versa.**

Note: Please use a staple (refer to syllabus). If not, I have to subtract 2 points.