PROBLEM 200-7

Assume a GaAs crystal with a (100) surface plane. Calculate the areal density (atoms pr sq. cm) of Ga atoms on the surface.

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> restart;
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We can choose to interprete the 100 surface of GaAs as a single layer og Ga (or As) or we can consider it as a double layer. The answer will be a factor of 2 different, we are however primarily interested in an order of magnitude.

Consider a the 001 surface of a unit cell, now only Ga atoms in the surface layer, there are one Ga on each of the four corners and one in the middle of the unit cells. Each of the four corner atom is shared by 4 other unit cell squares on each side. Thus there are a total of two, 2, Ga atoms pr unit cell with area a^2. So the number of atoms pr area is

```
> eq1:=N_Ga/A=2/a^2;
```

$$eq1 := \frac{N\_Ga}{A} = \frac{2}{a^2} \quad (1)$$

We put in the lattice constant of GaAs, a =5.6533 (ref http://www.siliconfareast.com/lattice_constants.htm)

```
> answ_1:=subs(a=5.6533e-10*m,eq1);
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$$answ\_1 := \frac{N\_Ga}{A} = \frac{6.257861264\ 10^{18}}{m^2} \quad (2)$$

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> answ_2:=subs(a=5.6533e-8*cm,eq1);
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$$answ\_2 := \frac{N\_Ga}{A} = \frac{6.257861264\ 10^{14}}{cm^2} \quad (3)$$

So we see (if we consider a double layer) we have about 1e15 at/cm^2.
This is a number we may keep in mind, when we later calculates how many gas atoms bombards a a surface area pr second at a certain pressure.