UNIVERSITÄT SIEGEN
FESTKÖRPERPHYSIK

Crystallography

I. Homework "2D crystal lattice"

*Define **a crystal lattice**, what do you need for its description?*

1. Depict the lattice, which has the following lattice constants:
   a) a = 1: b = 1; α = 90˚;
   b) a = 1; b = √2; α = 45˚;
   c) a = 1; b = √5; α = 22.5˚.

2. Describe the lattice with the following lattice constants:
   a) a = 1, b = 1, α = 60°;
   b) a = 1, b = 1, α = 120°.

3. The basis vectors of a lattice are given by ***a*** and ***b***. Prove that each pair of lattice vectors {**a**, *k***a**+**b**} (*k* is integer) are the basis vectors of the same lattice too.

4. The atomic positions ***R***, within the elementary cell are described by two components *x* and *y*, so ***R***=x***a***+y***b*** (0<=*x*<1, 0<=*y*<1), where ***a*** and ***b*** are the basis vectors. Depict and distinguish a difference between the crystals consisting of two atoms with the coordinates [1/3, 1/3] and [2/3, 2/3]. Lattice constants are
   a) a = 1, b = 1, α =60°;
   b) a = 1, b = 1, α =120°;
   c) a = 1, b = 1, α =90°.