

Eðlisfræði þéttfnis I

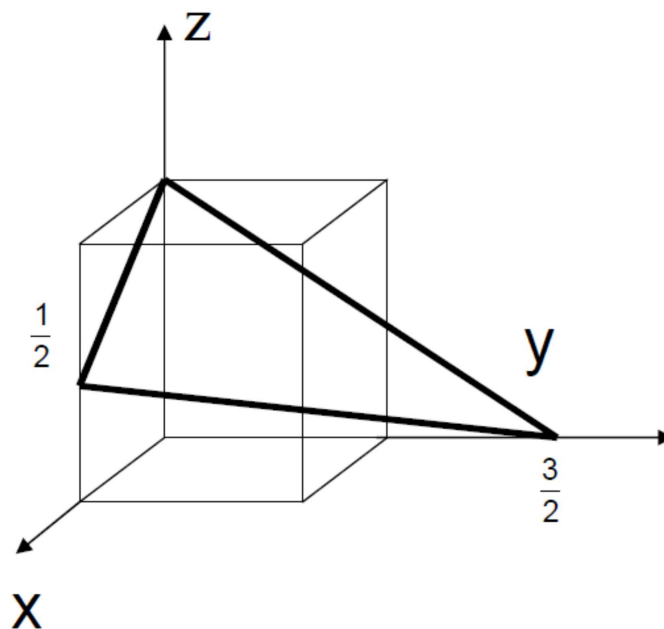
Dæmablað 2

Skilafrestur 7. September 2017 kl. 15:00

1. Miller vísir – Miller index (10)

Hver er Miller vísir plansins á myndinni ?

What is the Miller index for the plane in the figure ?

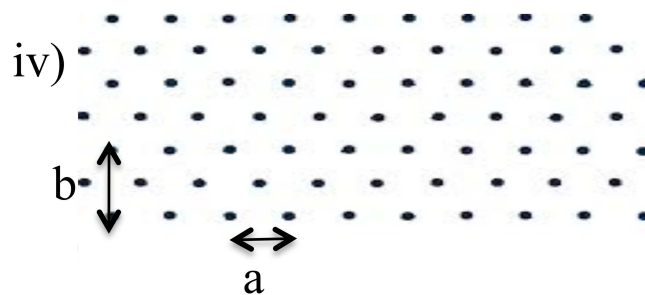
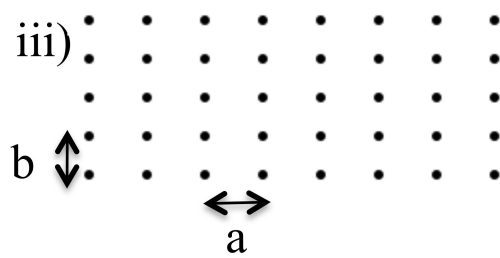
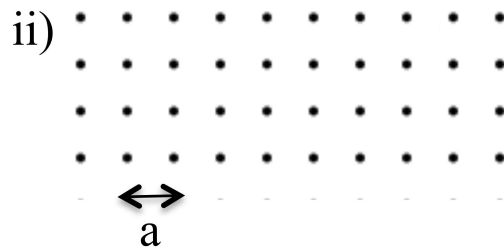
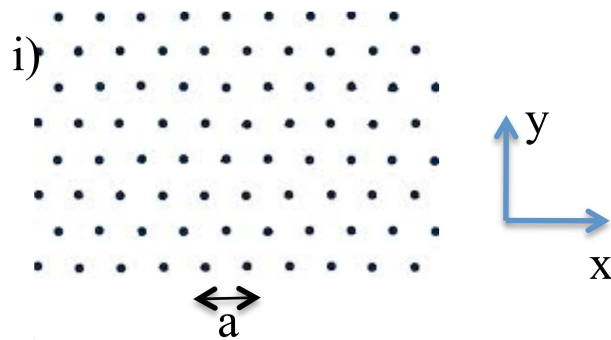


(Próf Desember 2016)

2. Lattices and primitive vectors (10)

For each of the following lattices:

- (a) Give two primitive vectors and draw them.
- (b) Draw a primitive cell
- (c) List all the point group symmetries of the lattice
- (d) Indicate the Bravais lattice type cell



3. Ionic crystals (15)

We can use the form

$$u(r) = -\frac{\alpha e^2}{r} + \frac{C}{r^m}$$

of the cohesive energy per ion pair to investigate the stability of the possible crystal structure an ionic crystal may assume. Assuming that the coupling constant C characterizing the contribution of the short-range repulsion is proportional to the coordination number Z , show that the equilibrium cohesive energy for different lattice types varies as $(\alpha^m/Z)^{1/(m-1)}$, and use the values of the Madelung constant α in the table below to construct a table of relative stability according to the value of m . (Hint: First examine the case of large or small m .)

Crystal structure	Madelung constant, α
Cesium chloride	1.7627
Sodium chloride	1.7476
Zinchblende	1.6381

4. Bravais grind – Bravais lattice (10)

Ef gefið er að grunnvigrar grindar séu $\mathbf{a} = (a/2)(\mathbf{i} + \mathbf{j})$, $\mathbf{b} = (a/2)(\mathbf{j} + \mathbf{k})$, og $\mathbf{c} = (a/2)(\mathbf{k} + \mathbf{i})$, þar sem \mathbf{i} , \mathbf{j} og \mathbf{k} eru þessir venjulegu einingavigrar í Kartesíusarhnitum, hver er þá Bravais grindin ?

Given that the primitive basis vectors of a lattice are $\mathbf{a} = (a/2)(\mathbf{i} + \mathbf{j})$, $\mathbf{b} = (a/2)(\mathbf{j} + \mathbf{k})$, and $\mathbf{c} = (a/2)(\mathbf{k} + \mathbf{i})$, where \mathbf{i} , \mathbf{j} and \mathbf{k} are the usual three unit vectors along cartesian coordinates, what is the Bravais lattice ?

(Próf Maí 2016)