

Eðlisfræði þéttfnis I

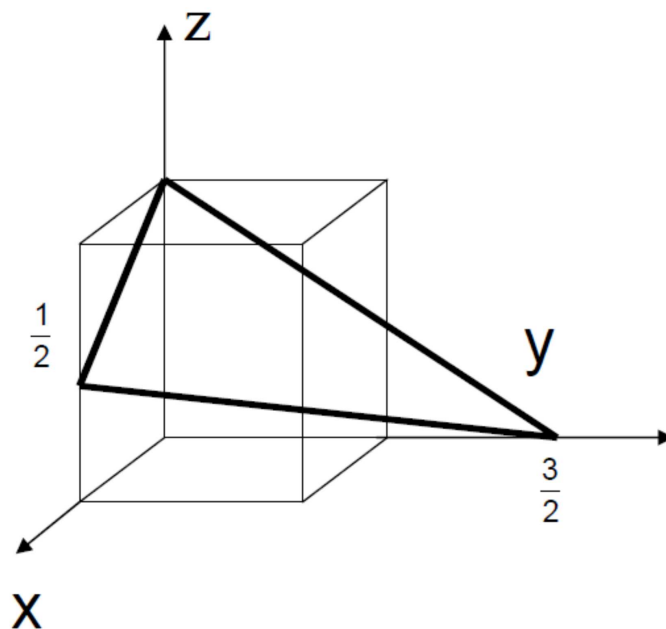
Dæmablað 2

Skilafrestur 11. September 2018 kl. 15:00

1. Miller vísir – Miller index (10)

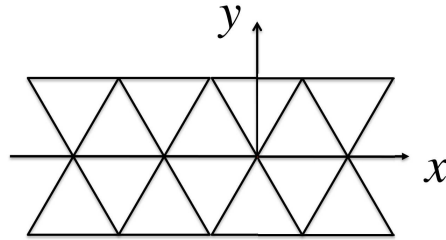
Hver er Miller vísir plansins á myndinni ?

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



(Próf Desember 2016)

2. Two-dimensional triangular lattice – reciprocal lattice (10)



(a) Merkið inn grunngrindareiningu í þessari tvívíðu þríhyrningsgrind. Finnið grunn vigranna.

(b) Finnið grunn viga nykurgrindarinnar.

(a) Identify the primitive unit cell of a two-dimensional triangular lattice. Find the basis vectors.

(b) Construct the basis vectors of the reciprocal unit cell.

(Próf Maí 2016)

3. Kristallsgerð og eðlismassi – Crystal structure and density (10)

Járn (56 g/mól) má finna bæði sem miðjusetinn tening (bcc) og sem hliðarsetinn tening (fcc) og ræðst af hitistigi hvor formgerðin kemur fram. Við gerum ráð fyrir að líta megi á atóm sem harðar kúlur af radía R sem er hinn sami fyrir báða fasa og er þannig að sérhver kúla rétt snerti næstu granna.

(a) Hvert er hlutfall eðlismassa þessara tveggja fasa ?

(b) Í bcc fasanum hefur járn eðlismassann 7900 kg m^{-3} . Hver er þá grindarfastinn ?

Iron (56 g/mole) can be found under both body centered cubic (bcc) and face centered cubic (fcc) depending on temperature. We will assume each atom can be modeled as a hard sphere the radius R of which is the same in both phases and is such that each sphere just touches its direct neighbors.

(a) What is the ratio of densities between the two phases ?

(b) In its bcc phase, iron has a mass density of 7900 kg m^{-3} . What is the conventional lattice constant ?

(Próf Desember 2017)

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)