材料導論 作業 1

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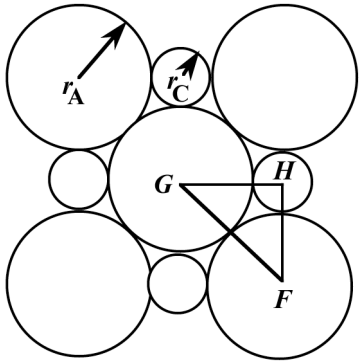
請用手寫回答，打字以零分計算

1. Show that the minimum cation-to-anion radius ratio for a coordination number of 6 is 0.414. [Hint: Use the NaCl crystal structure (Figure 3.6), and assume that anions and cations are just touching along cube edges and across face diagonals.]。(35 points)

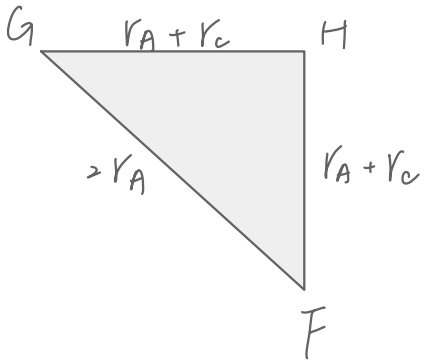
Type : AX

Anion Packing : FCC



$6\times\frac{1}{2}+8\times\frac{1}{8}$

$=4$



$$2r_A=(r_A+r_C)\sqrt{2}$$

$$(2-\sqrt{2})\,r_A=\sqrt{2}\,r_C$$

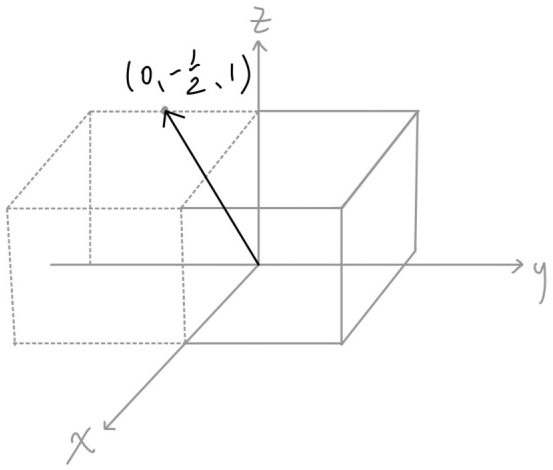
$$\frac{r_C}{r_A}=\frac{2-\sqrt{2}}{\sqrt{2}}$$

$$=\frac{0.586}{1.414}=0.414$$

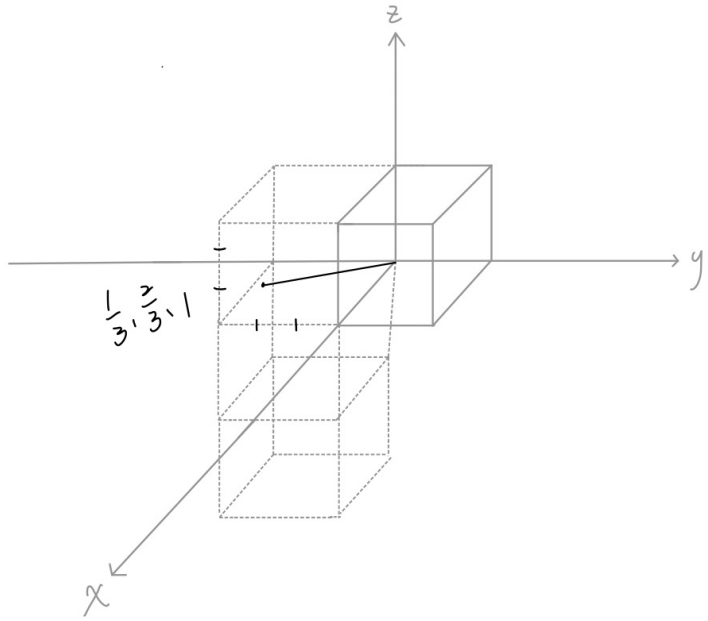
2. Within a cubic unit cell, sketch the following directions: (each 15 points, total 30 points)

(a) $[0\bar{1}2]$, *(b)* $[1\bar{2}\bar{3}]$

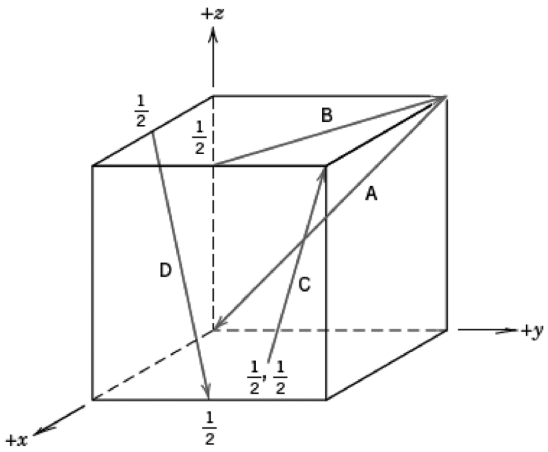
(a)



(b)



3. **Determine the indices for the directions shown in the following cubic unit cell: choose one of the directions to write (要寫推導過程).** (若有 1/3 同學寫同樣答案的，如都寫(A)，視為抄襲，以零分計算) (35 points).



(B)

head : $x: 0 \quad , \quad y = b \quad , \quad z = c$

tail : $x: a \quad , \quad y = \frac{1}{2}b \quad , \quad z = c$

$$\frac{0-a}{a} \qquad \frac{b-\frac{1}{2}b}{b} \qquad \frac{c-c}{c}$$

$$-1 \qquad \frac{1}{2} \qquad 0$$

$$\Rightarrow [-2 \quad 1 \quad 0] \ \#$$