1. Mass of 1 k mole of NaCl = 58.5 kg & number of molecules in 1 Kmole = 6.02×10^{26}.

$\therefore$ Mass of 1 NaCl molecule $= \dfrac{58.5}{6.02 \times 10^{26}} = 9.72 \times 10^{-26}$ kg

$\rho_{NaCl} = 2.16 \times 10^{3}$ kg/m^3.

$\therefore$ volume of 1 NaCl molecule $= \dfrac{9.72 \times 10^{-26}}{2.16 \times 10^{3}} = 4.5 \times 10^{-29}$ m^3

As 2 atoms constitute 1 NaCl molecule,

volume/atom $= \dfrac{4.5 \times 10^{-29}}{2} = 2.25 \times 10^{-29}$ m^3

$d^3 = 2.25 \times 10^{-29}$ $\therefore$ $d_{100} = 2.82$ Å.

Bragg's law $2d\sin\theta = n\lambda$, $n = 2$, $\lambda = d\sin\theta$
$= 2.82 \times 10^{-10} \sin 26°$
$= 1.24$ Å.

② Using Bragg's law $2d\sin\theta = n\lambda$

$\lambda = 0.5$ Å, $\theta = 5°$, $n = 1$. $\therefore$ $d = \dfrac{\lambda}{2\sin\theta} = \dfrac{0.5 \times 10^{-10}}{2 \times 0.0871} = 2.87$ Å

For 2nd order maximum, $2d\sin\theta' = 2\lambda$.

$\therefore$ $\sin\theta' = \dfrac{\lambda}{d} = \dfrac{0.5}{2.87}$. $\therefore$ $\theta' = 10.03°$.

③ $2d\sin\theta = n\lambda$, $d = \dfrac{n\lambda}{2\sin\theta} = \dfrac{1 \times 1.8 \times 10^{-10}}{2 \times \sin 60°} = 1.039$ Å

This is $d_{111} = \dfrac{a}{\sqrt{3}}$. and $d_{100} = a$.

$\therefore$ $a = \sqrt{3}\, d_{111} = 1.8 \times 10^{-10}$ m. $= 1.8$ Å.

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