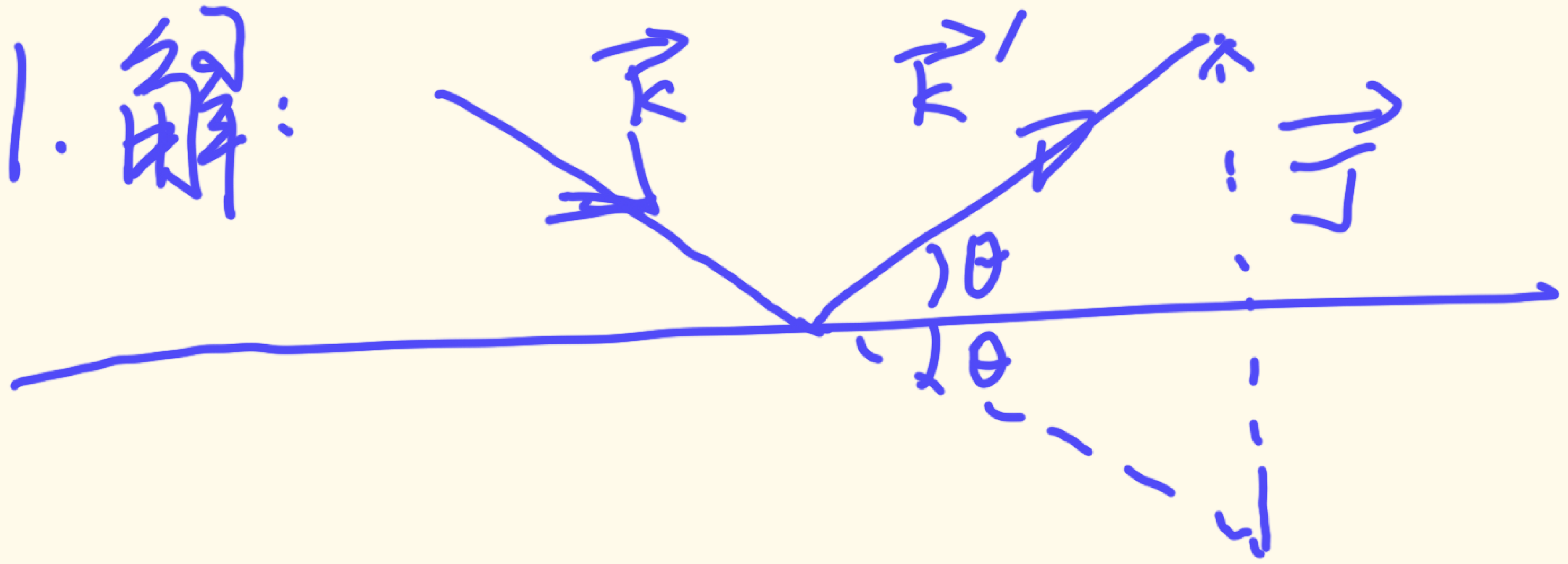
1. 解:



如图: $\vec{k'}-\vec{k}=\vec{J}$ 且 $k'=k=\frac{2\pi}{\lambda}$, $J=n\cdot\frac{2\pi}{d}$

故 $\vec{k'}^2=(\vec{k}+\vec{J})^2$ 则 $2\vec{J}\cos(\vec{k},\vec{J})+\vec{J}=0$

$(\vec{k},\vec{J})=\frac{\pi}{2}+\theta$ ∴ $\vec{J}=2k\sin\theta$ 即 $\lambda=\frac{2d}{n}\sin\theta$

2. 解: $F=f_{K^+}[e^{i[2\pi\cdot 0]}+e^{i[2\pi\cdot\frac{h+k}{2}]}+e^{i[2\pi\cdot\frac{k+l}{2}]}+e^{i[2\pi\cdot\frac{h+l}{2}]}]+f_{Cl^-}[e^{i[2\pi\cdot\frac{h}{2}]}+e^{i[2\pi\cdot\frac{k}{2}]}+e^{i[2\pi\cdot\frac{l}{2}]}+e^{i[2\pi\cdot\frac{h+k+l}{2}]}]$

$=[f_{K^+}+f_{Cl^-}e^{i\pi(h+k+l)}][1+e^{i\pi(h+k)}+e^{i\pi(k+l)}+e^{i\pi(l+h)}]$

如果h,k,l全为奇 $F^2=16(f_{K^+}+f_{Cl^-})^2$

如果h,k,l全为偶, $F^2=16(f_{K^+}-f_{Cl^-})^2$ 否则 $F=0$

3. (1) $d=\frac{a}{\sqrt{1^2+1^2+0^2}}=\frac{\lambda}{2\sin\theta}$ ∴ $a=0.291\,nm$

(2) $d'=\frac{\lambda}{2\sin\theta}=\frac{a}{\sqrt{3}}$ ∴ $\theta=27^\circ 19'$

(3) $\rho=\frac{m}{V}=\frac{2M}{a^3N_A}=7.549\,g/cm^3$