$$\mathcal{H} = c\vec{k}^2 + v_0 \vec{k} \cdot \vec{\sigma}$$

$c \rightarrow -14.8\,eV\,\text{Å}^2, -2.97\,\text{Å}^2, -1.55\,eV\,\text{Å}^2$,

$v_x \rightarrow 0.079\,eV\,\text{Å}$

$v_y = 0.036\,eV\,\text{Å}$

$v_z = 0.02\,eV\,\text{Å}$

$\vec{k} = |\vec{k}|\,\hat{k}$ (A9)$^{-1}$

Take $c \sim 2\,eV\,\text{Å}^2$

$v_0 \sim 0.1\,eV\,\text{Å}$

$\therefore \mathcal{H} = 2\,eV\,\vec{k}^2 + 0.1\,eV\,\vec{k}\cdot\vec{\sigma}$

$$S\left(\frac{e\hbar}{2m_e}\right)B \rightarrow S\mu_B B$$

$B = B$ Tesla

$\Downarrow$

$5.788 \times 10^{-5}\,eV/T$

$= 8 \times 5.8 \times 10^{-5}\,\text{BeV}$

09

E_{tot}

10

$= 2\,eV \left(\tilde{k}\right)^2 + 0.1\,eV \left(\tilde{k}\right)$

$+ 5.8 \times 10^{-5}\,eV + \left(\tilde{B}\right)$

11

$+ (0.1)\,eV$

$+ \frac{e\left(B\right)}{k_F}$

12

what units

01

$e = 1.6 \times 10^{-19}\,C$

02

03

$\frac{e}{\hbar} \frac{\hbar V}{K^2} k = \frac{eV}{\hbar}$

04

SUNDAY 24

Orm energy

$E_{om} = \frac{e(\hbar V)B}{\hbar k k}$

05

$= e\,0.1(eV)\mathring{A}\,B$

$\hbar\,\tilde{k}\,\mathring{A}^{-1}$

$V = V_0$

$0.1\,eV\mathring{A}$

$= 1.6 \times 10^{-19}\,(eV)(\mathring{A})^2$

$\hbar\,\tilde{k}$

$$e = 1.6 \times 10^{-19}\ C$$

$$E_{em} = \frac{0.1\ (eV)(\mathring{A})^2\ \vec{B}\ \text{Tesla}}{\hbar\ 6.63 \times 10^{-34}\ J\text{-sec}}$$

$$\times 1.6 \times 10^{-19}\ C$$

$$= \frac{1.6 \times 10^{-20+34}\ (\vec{B})\ \text{Tesla} \times 10^{-20}\ m^2 C}{\hbar\ 6.63\ (eV)\ J\text{-sec}}$$

$$= \frac{1.6 \times 10^{14-20}\ \vec{B}\ (eV)\ m^2\ A\text{-sec}\ J}{6.63\ \hbar\ J\text{-sec}\ A\ m^2}$$

$$= \frac{1.6}{6.63} \times 10^{-6}\ (eV)\ \frac{\vec{B}}{\hbar}$$

$D = 1 + e \frac{\vec{B}}{\hbar}, \Omega$

$\Omega \sim \frac{1}{\hbar^2}$

$e \frac{\vec{B}\ \text{Tes}}{\hbar^2 \hbar^2} (\mathring{A})^2$

$= \frac{\vec{B}\ 1.6 \times 10^{-19}\ C\ \text{Tesla}\ 10^{-20}\ m^2}{\hbar^2 (6.63 \times 10^{-34})^2\ J\ S}$

$= \frac{\vec{B}}{\hbar^2} \frac{1.6}{(6.63)^2} \times 10^{-39+34+34}$

$\times \frac{A\ S}{J\ S}\ m^2\ \text{Tesla}$

$T = \frac{J}{A\ m^2}$

$= \frac{\vec{B}}{\hbar} \frac{1.6}{(6.63)^2} \times$

$-39+34+37$

$= -5+37$

$= 32$

$e \frac{\vec{B}\ \text{Tesla}}{\hbar} \times \frac{1}{\hbar^2} (\mathring{A})^2$

$\times 10^{-19}\ A\ \text{Tesla}\ 10^{-20}\ m^2$

$= \frac{\vec{B}\ 1.6\ \text{Cunits}}{\hbar^2\ 6.63 \times 10^{-34}} \frac{10^{-19}}{10^{14}} \frac{A\ \text{Tesla}\ m^2}{J\ \text{Sec}}$

$\frac{1.6}{6.63} \times 10^{-5}\ A\ J$

$= \frac{\vec{B}}{\hbar}\ \text{Cunits}$

$= \frac{\vec{B}}{\hbar^2} \frac{16}{66.3}$

Units $= e \times \text{Å}$ $\quad \tilde{k} = \tilde{k}\,(\text{Å})^{-1}$ $\quad B = \tilde{B}$ Tesla

$$H_E = 2\,(eV)\,k^2 + 0.1\,(eV)\,\tilde{k} + 5.8\times10^{-5}\,(\tilde{B}\ \text{Tesla})\,\frac{eV}{\text{Tesla}} + \frac{1.6}{6.63}\times10^{-6}\,\tilde{B}\,(eV)$$

$$k = \tilde{k}\,(\text{Å})^{-1} = k_1\,(eV)$$

Berry curvature part in $\quad + \vec{B}\cdot\vec{\Omega}$ fac

$$\rightarrow \frac{16}{66.3}\times10^{-5}$$

fac $= 66.3$

$$\vec{v} = \frac{1}{\hbar}\nabla_{\vec{k}} \approx \frac{\text{Å}}{\hbar\tilde{k}}\,(eV)$$

$$= \frac{(eV)\,\text{Å}}{k}\ \frac{10^{-10}\ m}{6.63\times10^{-34}\ J\,s}\ \frac{\tilde{k}}{10^{-10}\ m}\ \frac{s}{kg\ \frac{m}{s}\ \tilde{k}}$$

$$= \frac{eV}{k}$$

$\frac{\hbar^2}{2m}$

$\frac{\hbar^2}{2 \times 1.4 m_e}$

$\rightarrow c = \frac{1}{2 \times 1.4 m_e}$ $\hbar^2$ in eV^2 / c in eV^{-1}

$\text{term 1} = c\hbar^2$ (1)

$\text{term 1} = 70 \text{ meV} \cdot \text{nm}$ (1)

$= 7 \times 10^{-8-3}$ eV m (1)

$1 m = \frac{10^3}{2 \times 10^{-14} \text{ GeV}} = \frac{10^{3+4-9}}{2}$

$cm^{-1} = 5 \times 10^{13}$ GeV $\Rightarrow$ $cm = \frac{1}{5 \times 10^{-13}}$ GeV

Wilcherk $cm = \frac{1}{2 \times 10^{-14+9}}$ eV

$\rightarrow 10^{-3} m = \frac{1}{2} \times 10^{5}$ eV^{-1}

$\rightarrow m = 5 \times 10^{4+3^2}$ eV$^{-1} = 5 \times 10^{7}$ /eV

$\rightarrow 1 \mathring{A} = 5 \times 10^{3}$ /eV

$\therefore C = 2(eV) \times (5 \times 10^{-3})^2$ /(eV)^2

$= 2 \times 25 \times 10^{-6}$ /(eV)

$C k^2 = \frac{50 \times 10^{-6}}{(eV)} \tilde{k}^2 (eV)^2$ $\quad u = \tilde{k}$

$C \rightarrow 5 \times 10^{-5}$ $= 50 \times 10^{-6} (\tilde{k}^2 eV)$

$(\hbar v) \tilde{k} eV = \tilde{k} v_0$ /$(eV)^2 \times 5 \times 10^{-3}$ /eV

$= \tilde{k} \times 5 \times 10^{-4}$ eV

$v_0 \rightarrow 5 \times 10^{-4}$ $= 5 \times 10^{-4} (\tilde{k} eV)$

SATURDAY 30 APRIL 2016
18th Week. 121-245

1 Tesla = 195 eV²

$$\mu_B = \frac{e\hbar}{2m_e} = \text{eV/Tesla}$$

$$= 5.788 \times 10^{-5} \text{ eV/Tesla}$$

$$\sim \frac{5.8 \times 10^{-5} \text{ eV}}{195 \text{ eV}^2} = \text{/eV}$$

$$\sim \frac{6}{2 \times 10^2} \times 10^{-5} \text{/eV}$$

$$\sim 3 \times 10^{-7} \text{/eV}$$

$$B = \tilde{B} \text{ (eV)}^2$$

So $\mu_B B$

$$= 3 \times 10^{-7} \left(\tilde{B} \text{ eV}\right)$$

$$m_{Bohr} = 3 \times 10^{-7}$$

$$V_0 = 5 \times 10^{-4}$$

$$C = 5 \times 10^{-5}$$