

FINAL EXAM – JUNE 11, 2013

The following equations and constants may be helpful to you. You may fill the space below the periodic table on p2 with handwritten notes.

$$E(\vec{k}) = \sum_{\vec{R}} e^{i\vec{k}\cdot\vec{R}} \langle \vec{0} | \hat{H} | \vec{R} \rangle \quad E(\vec{k}) = \frac{\hbar^2 k^2}{2m^*}$$

$$D_{\downarrow}(E) = \frac{V}{2\pi^2} \left(\frac{2m}{\hbar^2} \right)^{3/2} E^{1/2} \quad dS = D(E)dE$$

$$e^{i\theta} = \cos\theta + i\sin\theta$$

$$hc = 1240 \text{ eVnm}$$

$$\hbar = \frac{h}{2\pi} = 1.05 \times 10^{-34} \text{ Js} = 6.58 \times 10^{-16} \text{ eVs}$$

$$k_B = 1.38 \times 10^{-23} \text{ J/K} = 8.6 \times 10^{-5} \text{ eV/K} \quad e = 1.6 \times 10^{-19} \text{ C}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg} = 9.1 \times 10^{-28} \text{ g} = 0.511 \text{ MeV}/c^2$$

$$N_A = 6.02 \times 10^{23} \text{ atom/mol} \quad \epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}$$

$$\mu_B = \frac{e\hbar}{2m_e} = 9.27 \times 10^{-24} \text{ J/T} = 5.8 \times 10^{-5} \text{ eV/T}$$

$$v(\vec{k}) = \frac{1}{\hbar} \nabla_{\vec{k}} E(\vec{k}) \quad m^*(\vec{k}) = \frac{\hbar^2}{\nabla_{\vec{k}}^2 E(\vec{k})}$$

$$f_{FD} = \frac{1}{e^{(E-E_F)/k_B T} + 1}$$

$$\vec{g}_1 = 2\pi \frac{\vec{t}_2 \times \vec{t}_3}{\vec{t}_1 \cdot (\vec{t}_2 \times \vec{t}_3)} \quad \vec{g}_2 = 2\pi \frac{\vec{t}_3 \times \vec{t}_1}{\vec{t}_1 \cdot (\vec{t}_2 \times \vec{t}_3)} \quad \vec{g}_3 = 2\pi \frac{\vec{t}_1 \times \vec{t}_2}{\vec{t}_1 \cdot (\vec{t}_2 \times \vec{t}_3)}$$

$$\sigma = \frac{ne^2\tau}{m^*} \quad R_H = \frac{1}{nq}$$

$$\omega_p = \sqrt{\frac{ne^2}{\epsilon_0 m^*}}$$

$$\Delta V = S\Delta T$$

$$\vec{B} = \mu_0 (\vec{H} + \vec{M}) \quad \chi = \frac{M}{H} \approx \frac{\mu_0 M}{B}$$

$$\vec{D} = \epsilon_0 (\vec{E} + \vec{P}) \quad C_V = \frac{\pi^2}{3} D_{\downarrow}(E_F) k_B^2 T$$

$$\frac{K_{cl}}{\sigma T} = L = 2.45 \times 10^{-8} \text{ W}\Omega / \text{K}^2$$

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Periodic Table of the Elements © www.elementsdatabase.com

1 H																	2 He
3 Li	4 Be	■ hydrogen ■ poor metals ■ alkali metals ■ nonmetals ■ alkali earth metals ■ noble gases ■ transition metals ■ rare earth metals										5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar										
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Unq	105 Unp	106 Unh	107 Uns	108 Uno	109 Une	110 Uun								

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

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