

## CHAPTER 2

### 2.1) ENTROPY AND TEMPERATURE

- (a)  $\sigma = \log g = \log C + (3N/2)\log U$ .  
 $(\partial\sigma/\partial U)_N = 1/\tau = (3N/2)(1/U)$ , hence  $U = 3N\tau/2$ .
- (b)  $(\partial^2\sigma/\partial U^2)_N = (3N/2)(-1/U^2) < 0$ .

### 2.2) PARAMAGNETISM

States with spin excess  $2s$  have the energy  $U = -2smB$ , hence  $s = -U/2mB$ . Insertion into (40) yields (41). From (41) obtain  $(\partial\sigma/\partial U)_{N,B} = 1/\tau = -U/m^2B^2N$ . Solve for  $U$ :  $U = \langle U \rangle = -m^2B^2N/\tau = -MB$ . Hence  $M/Nm = mB/\tau$ .

### 2.3) QUANTUM HARMONIC OSCILLATOR

- (a) From (1.55):

$$\begin{aligned}\sigma &= \log g = \log(N+n-1)! - \log n! - \log(N-1)! \\ &\approx \log(N+n)! - \log n! - \log N!\end{aligned}$$

Replacing  $N-1$  by  $N$  is equivalent to neglecting a term  $-\log[(N+n)/N]$ , which for large  $N$  is small compared to the factorial terms. With the Stirling approximation:

$$\begin{aligned}\sigma &\approx (N+n) \log(N+n) - n \log n - N \log N \\ &= (N+n) \log[(N+n)/N] - n \log(n/N) \\ &= N[(1+n/N) \log(1+n/N) - (n/N) \log(n/N)].\end{aligned}$$

- (b) Set  $n = U/k\omega$  and  $Nk\omega = U_0(N)$ :

$$\sigma(U, N) = N[(1+U/U_0) \log(1+U/U_0) - (U/U_0) \log(U/U_0)].$$

# Thermal Physics Kittel Solutions Manual

**Charles Kittel, Paul McEuen**



## **Thermal Physics Kittel Solutions Manual:**

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**Introduction to Solid State Physics** Charles Kittel, Paul McEuen, 2018 Kittel's Introduction to Solid State Physics Global Edition has been the standard solid state physics text for physics majors since the publication of its first edition over 60 years ago The emphasis in the book has always been on physics rather than formal mathematics This book is written with the goal that it is accessible to undergraduate students and consistently teachable With each new edition the author has attempted to add important new developments in the field without impacting its inherent content coverage This Global Edition offers the advantage of expanded end of chapter problem sets

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**Books in Print Supplement**, 1988

**Library Journal**, 1969

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Subject Index of Modern Books Acquired British Library, 1961

**Scientific American**, 1970 Monthly magazine devoted to topics of general scientific interest

**Fundamentals of Ceramics** Michel Barsoum, 2019-12-12 Fundamentals of Ceramics presents readers with an exceptionally clear and comprehensive introduction to ceramic science This Second Edition updates problems and adds more worked examples as well as adding new chapter sections on Computational Materials Science and Case Studies The Computational Materials Science sections describe how today density functional theory and molecular dynamics calculations can shed valuable light on properties especially ones that are not easy to measure or visualize otherwise such as surface energies elastic constants point defect energies phonon modes etc The Case Studies sections focus more on applications such as solid oxide fuel cells optical fibers alumina forming materials ultra strong and thin glasses glass ceramics strong and tough ceramics fiber reinforced ceramic

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