

Contents

Contributors	v
General Preface	vii
Preface to Volume 2	ix

1. Thermodynamics

M. J. BUCKINGHAM

I. Introduction	2
II. Function-Tangent Contact	10
III. Asymptotic Analysis near the Critical Point	19
IV. Special Cases	31
References	38

2. Equilibrium Scaling in Fluids and Magnets

M. VICENTINI-MISSONI

I. Introduction	39
II. Theoretical Basis for Scaling Laws	40
III. Status of the Experiments	61
IV. Empirical Forms of $h(x)$	63
V. Parametric Representation	69
VI. Conclusion	76
References	77

3. Surface Tension of Fluids

B. WIDOM

I. Introduction	79
II. Scaling and Homogeneity Conjectures	80
III. Structure of the Interface	86
IV. Critique	93
Acknowledgements	99
References	99

4. Surface and Size Effects in Lattice Models

P. G. WATSON

I. Introduction	101
II. Effect of Modified Arrays on Thermodynamics	105
III. Effect of Modified Arrays on Correlations	140
IV. Effect of Finite Size	150
References	159

5. Exact Calculations on a Random Ising System

B. McCoy

I. Introduction	161
II. The Model	162
III. Specific Heat	164
IV. Spontaneous Magnetization and Spin Correlation Function of the Bulk	184
V. Boundary Magnetization	186
VI. Boundary Spin-Spin Correlation	191
VII. Discussion	193
References	195

6. Percolation and Cluster Size

J. W. Essam

I. Introduction	197
II. Critical Probabilities	202
III. Numerical Methods for Percolation Functions	226
IV. Critical Exponents	244
V. Dilute Ferromagnetism	249
VI. Related Topics	264
References	269

7. Melting and Statistical Geometry of Simple Liquids

R. Collins

I. Introduction	271
II. Theoretical Results in Statistical Theory	274
III. Empirical Physical and Computer Models	282
IV. Geometry and Fluid Thermodynamics	290
V. Summary and Conclusions	300
References	301

8. Lattice Gas Theories of Melting

L. K. Runnels

I. Introduction	305
II. Athermal (Hard Molecules) Systems	308
III. Comparison with the Continuum Model	314
IV. Lattice Models with Square Well Potentials	315
V. Asymmetric Molecules	326
References	327

9. Closed Form Approximations for Lattice Systems

D. M. Burley

I. Introduction	329
II. Mean Field and Constant Coupling Approximations	333
III. Cluster Variation Method	341
IV. Comparisons	350
V. Further Improvements and Methods	363
References	373

10. Critical Properties of the Spherical Model

G. S. JOYCE

I. Introduction	375
II. Basic Results	379
III. Behaviour of the Green's Function $P(z)$ for $z \lesssim 1$	387
IV. Critical Behaviour of Thermodynamic Properties	400
V. Correlation Functions	427
Acknowledgements	440
References	440

11. Kinetics of Ising Models

K. KAWASAKI

I. Introduction	443
II. Master Equation Approach	445
III. Kinetic Ising Models	456
IV. Exactly Solvable Cases	465
V. Approximate Methods	473
VI. Numerical Methods	481
VII. Derivation of Kinetic Ising Models	489
VIII. Applications	491
Appendix A.	493
Appendix B... .. .	496
References	498
Author Index	503
Subject Index	511