RUTGERS UNIVERSITY, DEPARTMENT OF PHYSICS & ASTRONOMY, SSP 1/2017 – 601

HomeWork #1. *Due September 20.*

Jak Chakhalian

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1 HEAT CAPACITY AT THE 2^{nd} ORDER PHASE TRANSITION.

1. Using the definition of specific heat $c_p = T(dS/dT)_V$, $S = -(d\Phi/dT)_P$, η^2 and Φ_{min} derived in class, find the behavior of c_p at the 2^d order transition.

2. Using results from 1.1 calculate total entropy in the ordered state $S_{ord} = \int_o^{T_c} c_p(T)/T dT$ for the case when *spin* is $S = 1/2$ (note here S is spin not entropy!).

3. Comment on the physical meaning of this specific numerical value if experiment finds it greater or less than calculated S_{ord} for $S = 1/2$ (again here S refers to spin). $Hint$: In the fully disordered phase above T_c, the total number of possible states is $2S + 1$ and the spin entropy must be removed when T goes to zero.

2 CONNECTION BETWEEN SPECIFIC HEAT JUMP Δc_p , COMPRESSIBILITY AND THERMAL EXPANSION.

Find the connection between specific heat jump Δc_p at the second-order transition T_c (take the Δc_p result from Problem 1.1) and

- thermal expansion $\beta = 3\alpha = 1/V(dV/dT)$
- compressibility $\kappa = -1/V(dV/dP)$

Hint: Those formulae are also known as the Ehrenfest relations.