Statistical Mechanics
Problem Review

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1

What will be the correlation when $T > T_c$? Give a value of correlation length typically when temperature is extremely high?
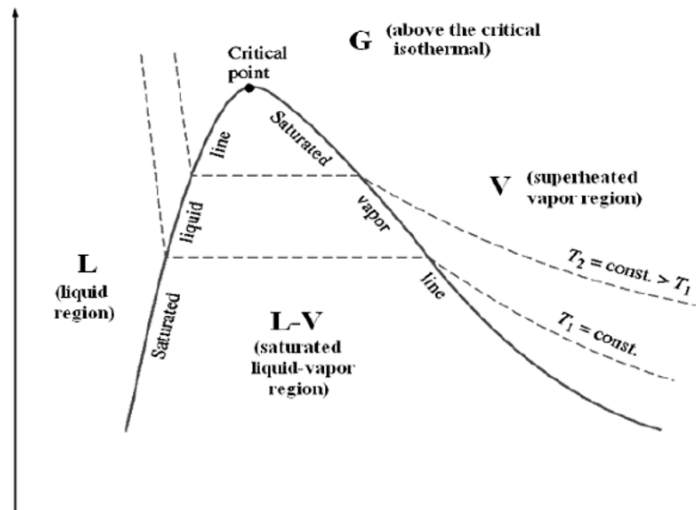
Answer:

$$< (\phi(r)- < \phi(r) >)(\phi(r')- < \phi(r') >) >= e^{-\frac{r-r'}{\xi}} \tag{1}$$

When $T > T_c$, $< \phi >= 0$; When temperature is high enough there would be no correlation, $\xi \to 0$

2

Draw the diagram of magnetic field VS. magnetization at $T < T_c$, $T = T_c$ and $T > T_c$ (use the P-V diagram as a reference if it will be helpful). What makes magnetization transition at $T < T_c$?

Answer:

The exchange effect J is sufficiently large to cause neighbouring atomic spins to spontaneously align.