

Reading Assignment Ch. 12

C. Kimber

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3

The relationship governing this question is

$$\frac{1}{T} = \frac{\partial S}{\partial q}$$

Therefore if the entropy changes rapidly with increasing energy (a relatively high $\frac{\partial S}{\partial q}$), then the temperature is low. This inverse proportionality insinuates high temperatures correspond to small changes in entropy in relation to energy.

6

The entropy of an open system can decrease, but the entropy of the surroundings must increase by a larger amount. The net change in entropy must be greater than zero according to the second law of thermodynamics.

7

I would expect block A to have 60 quanta, and block B to have 40 quanta (1). Additionally, the temperatures would be the same (4), since their $\frac{dS}{dq}$ would be equal. However, the entropies would not (3).

True:

1, 4

10

It is true that $e^{-\Delta E/k_B T}$ is small when ΔE is large (1). It is also true that it is small when T is small (2). Neither 3 nor 4 are true, however. For example, the ratio of 'spin up spin up' to 'spin up spin down' neutral hydrogen atoms in the interstellar medium is 3-to-1, so the lowest energy level is not always the most populated.

True:

1, 2