Assignment 5

The due date for submitting this assignment has passed. As per our records, you have not submitted this assignment.

1. The sum of all of the microscopic form of energy is called
   \[ \text{Total energy} \] 2 points
   \[ \text{Macro energy} \]
   \[ \text{System energy} \]
   \[ \text{Internal energy} \]

   No, the answer is incorrect.

   Accepted Answers:
   \[ \text{Total energy} \]
   \[ \text{Macro energy} \]
   \[ \text{System energy} \]
   \[ \text{Internal energy} \]

2. Statistical Thermodynamics assumes the existence of atoms and molecules and provides explicit expressions for the macroscopic thermodynamic quantities which are used to calculate the quantity of interest in molecular dynamics
   \[ T \] 2 points
   \[ P \]
   \[ \text{Rate} \]

   No, the answer is incorrect.

   Accepted Answers:
   \[ T \]
   \[ P \]
   \[ \text{Rate} \]

3. Weyl's position is a point belonging to a set of points for which site symmetry groups are congruent subgroup of the space group
   \[ \text{Yes} \]
   \[ \text{No} \]

   No, the answer is incorrect.

   Accepted Answers:
   \[ \text{Yes} \]
   \[ \text{No} \]

4. An isolated system having a constant number of atoms occupying a volume \( V \) and a constant energy is called the microcanonical ensemble.
   \[ \text{Yes} \]
   \[ \text{No} \]

   No, the answer is incorrect.

   Accepted Answers:
   \[ \text{Yes} \]
   \[ \text{No} \]

5. The equation relating the entropy, \( S \), and the number of real microstates (corresponding to a given macrostate) is
   \[ S = k \log \Omega \]
   \[ S = k \log \Omega \]
   \[ S = \frac{k}{2} \log \Omega \]
   \[ S = k \Omega \]

   No, the answer is incorrect.

   Accepted Answers:
   \[ S = k \log \Omega \]
   \[ S = k \log \Omega \]
   \[ S = \frac{k}{2} \log \Omega \]
   \[ S = k \Omega \]

6. Compute the following equations:
   \[ \begin{align*}
   \frac{dS}{dT} &= \frac{dE}{dT} \\
   \frac{dS}{dE} &= \frac{dE}{dS} \\
   \end{align*} \]
   \[ -P \text{ and } -T \]
   \[ P \text{ and } T \]
   \[ -P \text{ and } T \]
   \[ -T \text{ and } P \]

   No, the answer is incorrect.

   Accepted Answers:
   \[ -P \text{ and } -T \]
   \[ P \text{ and } T \]
   \[ -P \text{ and } T \]
   \[ -T \text{ and } P \]

7. The expression for the thermodynamic \( f \) in terms of Helmholtz's constant \( K_B \) and temperature \( T \) is
   \[ f = \frac{K_B}{T} \]
   \[ f = \frac{K_B}{T} \]
   \[ f = T \]
   \[ f = \frac{T}{K_B} \]

   No, the answer is incorrect.

   Accepted Answers:
   \[ f = \frac{K_B}{T} \]
   \[ f = \frac{K_B}{T} \]
   \[ f = T \]
   \[ f = \frac{T}{K_B} \]

8. Classical or Newtonian mechanics generally deals with the connections between the microscopic degrees of freedom and macroscopic thermodynamic properties.
   \[ \text{True} \]
   \[ \text{False} \]

   No, the answer is incorrect.

   Accepted Answers:
   \[ \text{True} \]
   \[ \text{False} \]

9. A molecule belongs to the space group \( I4_1 \) with \( a = b = c = 1.844 \text{Å}, a = b = c = 1.844 \text{Å}. One of the atoms in the Weyl's position 4a
   \[ \text{No} \]
   \[ \text{Yes} \]

   Accepted Answers:
   \[ \text{No} \]
   \[ \text{Yes} \]

   The values of \( x \) and \( y \) are
   \[ x = 0.25, y = 0.25 \text{ and } \theta = 30° \]
   \[ x = 0.25, y = 0.25 \text{ and } \theta = 15° \]
   \[ x = 0.25, y = 0.25 \text{ and } \theta = 7.5° \]
   \[ x = 0.25, y = 0.25 \text{ and } \theta = 30° \]

   No, the answer is incorrect.

   Accepted Answers:
   \[ x = 0.25, y = 0.25 \text{ and } \theta = 30° \]
   \[ x = 0.25, y = 0.25 \text{ and } \theta = 15° \]
   \[ x = 0.25, y = 0.25 \text{ and } \theta = 7.5° \]
   \[ x = 0.25, y = 0.25 \text{ and } \theta = 30° \]