Assignment 04

1. Helmholtz free energy $F$ is related to the canonical partition function $Q$ in 1 point.
   
   $F = -k_B T \ln Q
   
   $\therefore k_B T \ln Q = F$

   No. the answer is incorrect. Score 0

   Accepted Answers:
   - $F = -k_B T \ln Q$
   - $k_B T \ln Q = F$

2. Variance of energy is defined as 1 point.
   
   $\sigma^2 = \langle E^2 \rangle - \langle E \rangle^2
   
   No. the answer is incorrect. Score 0

   Accepted Answers:
   - $\sigma^2 = \langle E^2 \rangle - \langle E \rangle^2$
   - $\langle E^2 \rangle - \langle E \rangle^2$

3. Canonical ensemble is also known as ____ ensemble 1 point.
   
   No. the answer is incorrect. Score 0

   Accepted Answers:
   - $N_V$
   - $N_V T$
   - $N_V T^2$
   - $\mu T$

4. Variance of energy in canonical ensemble $\sigma^2_E$ is related to the average energy $\langle E \rangle$ by the relation 1 point.
   
   $\sigma^2_E = \langle E^2 \rangle - \langle E \rangle^2
   
   No. the answer is incorrect. Score 0

   Accepted Answers:
   - $\sigma^2_E = \langle E^2 \rangle - \langle E \rangle^2$
   - $\langle E^2 \rangle - \langle E \rangle^2$

5. If the canonical partition function of a material is $\sum_q \exp(-\beta q)$ where $\beta$ is an arbitrary constant and $\sum_q \exp(-\beta q) \leq 1$ energy variance is given as 1 point.
   
   $\sigma^2_E = 2 \sum q^2 \exp(-\beta q)
   
   No. the answer is incorrect. Score 0

   Accepted Answers:
   - $\sum q^2 \exp(-\beta q)$
   - $2 \sum q^2 \exp(-\beta q)$
   - $\sum q^2 \exp(-\beta q)$
   - $\sum q \exp(-\beta q)$

6. Partition function in the grand canonical ensemble is written as 1 point.
   
   $Z = \sum \exp(-\beta \mu n_i)
   
   No. the answer is incorrect. Score 0

   Accepted Answers:
   - $\sum \exp(-\beta \mu n_i)$
   - $\exp(-\beta \mu n_i)$
   - $\exp(-\beta \mu n_i) + \exp(-\beta \mu n_i)$
   - $\exp(-\beta \mu n_i)$

7. The Laplace's mediatrissa appearing in the grand canonical ensemble is related to the chemical potential $\mu$ as 1 point.
   
   $\exp(-\beta \mu n_i)
   
   No. the answer is incorrect. Score 0

   Accepted Answers:
   - $\exp(-\beta \mu n_i)$
   - $\mu n_i$
   - $\exp(-\beta \mu n_i)$
   - $\exp(-\beta \mu n_i)$

8. The variance of the number of molecules in the grand canonical ensemble is given as 1 point.
   
   $\sigma^2 = \langle n^2 \rangle - \langle n \rangle^2
   
   No. the answer is incorrect. Score 0

   Accepted Answers:
   - $\langle n^2 \rangle - \langle n \rangle^2$
   - $\langle n \rangle^2 - \langle n \rangle^2$
   - $\langle n^2 \rangle$
   - $\langle n \rangle$

9. The Gibbs free energy is defined in terms of the partition function of the isothermal-isobaric ensemble $\beta$ as 1 point.
   
   $G = k_B T \ln Z
   
   - $k_B T \ln Z$
   - $k_B T^2 \ln Z$
   - $k_B T \beta Z$
   - None of the above

   No. the answer is incorrect. Score 0

   Accepted Answers:
   - $k_B T \ln Z$
   - $k_B T^2 \ln Z$
   - $k_B T \beta Z$
   - None of the above

10. It is related to the number of ways of distribution $W$ is the microcanonical ensemble as 1 point.
    
    $G = \frac{1}{2} k_B T \ln W
    
    - $k_B T \ln W$
    - $k_B T \frac{1}{2} \ln W$
    - $\frac{1}{2} k_B T \ln W$
    - $\frac{1}{2} k_B T W$

    No. the answer is incorrect. Score 0

    Accepted Answers:
    - $\frac{1}{2} k_B T \ln W$
    - $k_B T \ln W$
    - $k_B T \frac{1}{2} \ln W$
    - $\frac{1}{2} k_B T W$