Unit 12 - Week 10

Assignment 10

The due date for submitting this assignment has passed. **Due on 2019-04-10, 23:59 IST**
As per our records you have not submitted this assignment.

1) *1 point*

A system of two identical Bosons, each of mass m, is placed in a one dimensional box of lengt L. If the energy of the systems is $5\hbar^2\pi^2/(2mL^2)$, then the space part of the wave function i given by

- $\Psi(1,2) = \sqrt{\frac{2}{L}}\left[\sin\frac{\pi x_1}{L}\sin\frac{2\pi x_2}{L} + \sin\frac{\pi x_2}{L}\sin\frac{2\pi x_1}{L}\right]$
- $\Psi(1,2) = \sqrt{\frac{2}{L}}\left[\sin\frac{\pi x_1}{L}\sin\frac{2\pi x_2}{L} - \sin\frac{\pi x_2}{L}\sin\frac{2\pi x_1}{L}\right]$
- $\Psi(1,2) = \frac{\sqrt{2}}{L}\left[\sin\frac{\pi x_1}{L}\sin\frac{2\pi x_2}{L} + \sin\frac{\pi x_2}{L}\sin\frac{2\pi x_1}{L}\right]$
- $\Psi(1,2) = \frac{\sqrt{2}}{L}\left[\sin\frac{\pi x_1}{L}\sin\frac{2\pi x_2}{L} - \sin\frac{\pi x_2}{L}\sin\frac{2\pi x_1}{L}\right]$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\Psi(1,2) = \frac{\sqrt{2}}{L}\left[\sin\frac{\pi x_1}{L}\sin\frac{2\pi x_2}{L} + \sin\frac{\pi x_2}{L}\sin\frac{2\pi x_1}{L}\right]$$

2) *1 point*

The Hamiltonian for the ultra-relativistic particle or photon is given by $H(p) = cp$, wh the velocity of light and p is the photon momentum. The thermal wavelength for the is given by

- $k_BT/(hc)$
- $hc/(k_BT)$
- p/h
- $h/(\sqrt{2m\pi k_BT})$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$hc/(k_BT)$

3) *1 point*

If $\mathcal{Q}$ is the partition function of grand canonical ensemble, then the equation of state f quantum ideal gas can be written as

- $\frac{PV}{k_BT} = 0$
- $\frac{PV}{k_BT} = 2^N \ln \mathcal{Q}(\mu, V, T)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{PV}{k_BT} = \ln \mathcal{Q}(\mu, V, T)$

4) 1 point

A gas of N identical Boson particles, each of mass m, is kept in a volume V. If the energy of the state is ϵ, then the occupation probability is written as $f(\epsilon) = \frac{1}{e^{(\epsilon-\mu)/k_BT} - 1}$. In the limit $\mu \to 0$, the relation between the temperature and the total number of particles is given as

- $\lim_{\mu \to 0} T \sim N^{3/2}$
- $\lim_{\mu \to 0} T \sim N^{2/3}$
- $\lim_{\mu \to 0} T \sim N^{1}$
- $\lim_{\mu \to 0} T \sim N^{0}$.

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\lim_{\mu \to 0} T \sim N^{2/3}$

5) 1 point

For a system of free particles, the relation between density of states the energy E in one two dimensions scale respectively as

- $E^{1/2}$ and E^{0}
- $E^{-1/2}$ and $E^{1/2}$
- $E^{-1/2}$ and E^{1}
- $E^{-1/2}$ and E^{0}

No, the answer is incorrect.
Score: 0

Accepted Answers:
$E^{-1/2}$ and E^{0}

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