Target IIT-JAM-2017

Test Series-2

Booklet Code: B

MODERN PHYSICS + THERMODYNAMICS

Duration: 2:00 Hours | **PHYSICS-PH** | **Date: 08-01-2017**

Maximum Marks: 100

Read the following instructions carefully:

1 Attempt all the questions.

2. **Section-A** contains **30** Multiple Choice Questions (MCQ). Each question has 4 choices (a), (b), (c) and (d), for its answer, out of which **ONLY ONE** is correct. From **Q.1 to Q.10** carries 1 Marks and **Q.11 to Q.3**0 carries 2 Marks each.

3. **Section-B** contains **10** Multiple Select Questions(MSQ). Each question has 4 choices (a), (b), (c) and (d) for its answer, out of which **ONE or MORE than ONE** is/are correct. For each correct answer you will be awarded **2 marks.**

4. Section**-C** contains **20** Numerical Answer Type (NAT) questions. From **Q.41 to Q.50** carries **1 Mark** each and **Q.51 to Q.60** carries **2 Marks** each. For each NAT type question, the value of answer in between 0 to 9.

5. In all sections, questions not attempted will result in zero mark. In Section–A (MCQ), wrong answer will result in negative marks. For all **1 mark** questions, **1/3 marks** will be deducted for each wrong answer. For all **2 marks** questions, **2/3 marks** will be deducted for each wrong answer. In Section–B (MSQ),there is no negative and no partial marking provision. There is no negative marking in Section –C (NAT) as well.

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Section-A : Multiple Choice Questions (MCQ)

Q.1 to Q.10: Carry 1 Mark each.

1. A blackbody at temperature T emits radiaion at a peak frequency ν_0. If the temperature of the blackbody becomes $3T$, the new peak frequency is

(a) $3\nu_0$ (b) $9\nu_0$ (c) $\frac{1}{3}\nu_0$ (d) $\frac{1}{9}\nu_0$

2. The density of states 'N' for a 1-D infinite potential well of width 'a', satisfies the following:

(a) $N \propto \sqrt{E}$ (b) $N \propto \frac{1}{\sqrt{E}}$ (c) $N \propto E^{3/2}$ (d) N is independent of E

3. In which of the following systems will the radius the first Bohr orbit of electron, be minimum?
(a) Hydrogen atom (b) Deuterium atom
(c) Singly ionized helium (d) Doubly ionized lithium

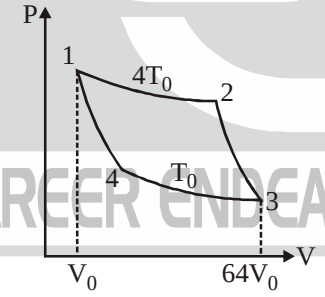
4. The speed at which the mass of an electron will be three times of its rest mass, is

(a) $\frac{1}{2}c$ (b) $\frac{1}{\sqrt{2}}c$ (c) $\frac{2\sqrt{2}}{3}c$ (d) $\frac{\sqrt{3}}{2}c$

5. The decay constant of a radioactive sample is λ. The half-life and the average-life of the sample are respectively

(a) $\frac{1}{\lambda}$ and $\frac{\ln 2}{\lambda}$ (b) $\frac{\ln 2}{\lambda}$ and $\frac{1}{\lambda}$ (c) $\frac{\lambda}{\ln 2}$ and $\frac{1}{\lambda}$ (d) $\frac{1}{\lambda}$ and $\frac{\lambda}{\ln 2}$

6. A carnot engine has a cycle as shown in the figure. If w and w' represent workdone by one mole of monatomic and diatomic gas, respectively, then



(a) $w' = w$ (b) $w' = 2w$ (c) $w' = 3w$ (d) $3w' = w$

7. Two identical bodies have internal energy U = NCT, with a constant C. The values of N and C are the same for each body. The initial temperature of the bodies are T_1 and T_2 and they are used as a source of work by connecting them to a carnot heat engine and bringing them to a common find temperature T_f. The value of T_f is is given by

(a) $\frac{(T_1 + T_2)}{2}$ (b) $\frac{2T_1T_2}{(T_1 + T_2)}$ (c) $\sqrt{T_1T_2}$ (d) $\sqrt{2T_1T_2}$

8. In **Q.7,** the amount of work which is delivered is

(a) $NC(T_1 + T_2 + 2T_f)$ (b) $NC(T_1 + T_2 - 2T_f)$
(c) $NC(T_1 + T_2 + T_f)$ (d) $NC(T_1 + T_2 - T_f)$

9. One kg of M_2O at 0 °C is brought in contact with a heat reservoir at 100 °C, when the water has reached 100 °C the change in entropy of the water is ΔS_{H_2O}. Which of the following is TRUE ?
(Given : $C_{H_2O} = 4.18$ J/gm)

(a) $\Delta S_{H_2O} = 1305$ J/K (b) $\Delta S_{H_2O} = -1305$ J/K

(c) $\Delta S_{H_2O} = 184$ J/K (d) $\Delta S_{H_2O} = -11121$ J/K

10. A thermally insulated box is separated into two compartments (volumes V_1 and V_2) by a membrane. One of the compartments contains an ideal gas at temperature T and the other is empty (vacuum). The membrane is suddenly removed and the gas fills up the two compartments and reaches equilibrium temperature T_e given by

(a) $T_e = T$ (b) $T_e = \frac{V_2}{V_1}T$ (c) $T_e = \frac{V_1}{V_2}T$ (d) $T_e = \frac{V_1}{(V_1 + V_2)}$

Q.11 to Q.30: Carry 2 Marks each.

11. The lifetime of a nucleus in an excited state is 10^{-12} sec. The probable uncertainity in the frequency of gamma-ray photon emitted by the nucleus will be

(a) 1.2×10^{11} *Hz* (b) 1.6×10^{11} *Hz* (c) 2.0×10^{11} *Hz* (d) 2.4×10^{11} *Hz*

12. Consider the two lowest normalized energy eigenfunctions $\psi_0(x)$ and $\psi_1(x)$ of a one dimensional system. They satisfy $\psi_0(x) = \psi_0^*(x)$ and $\psi_1(x) = \alpha\frac{d\psi_0}{dx}$, where α is a real constant. The expectation value of the momentum operator in the state $\psi_1(x)$ is

(a) $-\frac{\hbar}{\alpha^2}$ (b) $\frac{\hbar}{\alpha^2}$ (c) $\frac{2\hbar}{\alpha^2}$ (d) 0

13. Consider the operator $\hat{a} = \hat{x} + \frac{\hat{d}}{dx}$ acting on smooth functions of *x*. The commutator bracket $[\hat{a}, \cos\hat{x}]$ will be equal to

(a) $-\sin\hat{x}$ (b) $\sin\hat{x}$ (c) $\cos\hat{x}$ (d) $-\cos\hat{x}$

14. In the 1-D harmonic oscillator problem, the creation $(\hat{a}^\dagger)$ and annihilation $(\hat{a})$ operator in dimension less units $(\hbar = m = \omega = 1)$ are defined by

$$\hat{a} = \frac{\hat{x} + i\hat{p}}{\sqrt{2}},\ \hat{a}^\dagger = \frac{\hat{x} - i\hat{p}}{\sqrt{2}}$$

An unnormalized energy eigenfunction is $\psi = (2x^2 - 1)e^{-x^2/2}$. The corresponding eigenfunction for the next excited state, will be

(a) $\sqrt{\frac{2}{3}}(2x^3 + 3x)e^{-x^2/2}$ (b) $\sqrt{\frac{2}{3}}(2x^3 - 3x)e^{-x^2/2}$

(c) $\sqrt{\frac{2}{3}}(3x^3 - 2x)e^{-x^2/2}$ (d) $\sqrt{\frac{2}{3}}(3x^3 + 2x)e^{-x^2/2}$

15. A simple harmonic oscillator has a potential energy $V_0(x) = \frac{1}{2}m\omega^2 x^2$. If an additional potential energy term $V_1(x) = ax^2 + bx + c$ (where $a < 0, b > 0, c > 0$) is added to it, then

(a) the motion will be no longer simple harmonic
(b) the motion will be simple harmonic with increased frequency and around a shifted equillibrium.
(c) the motion will be simple harmonic with decreased frequency and around a shifted equillibrium.
(d) the motion will be simple harmonic with same frequency and around a shifted equillibrium.

16. A particle of mass *m* trapped in the n^{th} state of the following potential:

$$V(x) = \begin{cases} 0 & \text{for } 0 < x < a \\ \infty & \text{otherwise} \end{cases}$$

The probability of finding the trapped particle between $x = 0$ and $x = \frac{a}{n}$, will be

(a) 1/2 (b) 1/3 (c) 1/4 (d) 1/*n*

17. A beam of neutrons and another beam of protons (each particle has an energy of 10 eV), are incident separately on two identical barriers respectively each of 50 eV high and 30 A^0 wide. Which of the following is a **CORRECT** statement?

(a) The neutron will have greater transmission compared to proton.
(b) The proton will have greater transmission compared to neutron.
(c) Both neutron and proton will have equal tranmission probabilities.
(d) Neither neutron nor protons can cross the barrier.

18. An atom of mass *M* can be excited to a state of mass $M + \Delta$ by photon capture. The frequency of the photon which can cause this transition is

(a) $\frac{\Delta c^2}{h}$ (b) $\frac{\Delta^2 c^2}{2Mh}$ (c) $\frac{\Delta c^2(2M + \Delta)}{2Mh}$ (d) $\frac{\Delta c^2(2M + \Delta)}{h}$

19. A rod of length *l* carries a total charge *q* distributed uniformly. If this is observed in a frame moving with a speed *v* along the rod, the charge per unit length measured by the moving observer will be

(a) $\frac{q}{l}\left(1 - \frac{v^2}{c^2}\right)$ (b) $\frac{q}{l}\sqrt{1 - \frac{v^2}{c^2}}$ (c) $\frac{q}{l\sqrt{1 - \frac{v^2}{c^2}}}$ (d) $\frac{q}{l\left(1 - \frac{v^2}{c^2}\right)}$

20. The binding energy of a light nucleus (*Z*, *A*) in MeV is given by the approximate formula:

$$B(Z, A) \approx 16A - 20A^{2/3} - \frac{3}{4}z^2 A^{-1/3} + 30\frac{(N - Z)^2}{A}$$

where $N = A - Z$ is the neutron number. The value of *Z* of the most stable isobar for a given *A* is

(a) $\frac{A}{2}\left(1 - \frac{A^{2/3}}{160}\right)^{-1}$ (b) $\frac{A}{2}\left(1 - \frac{A^{2/3}}{120}\right)^{-1}$ (c) $\frac{A}{2}\left(1 + \frac{A^{4/3}}{120}\right)^{-1}$ (d) $\frac{A}{2}\left(1 - \frac{A^{4/3}}{160}\right)^{-1}$

21. A system has two energy levels of energies 0 and ε with degeneracies 1 and 3 respectively. The temperature at which the probability of finding the system in the lower energy is equal to half is

(a) ε k ln 3 (b) $\frac{\varepsilon}{\text{k ln 3}}$ (c) ∞ (d) $\frac{\varepsilon}{\text{k ln}\left(\frac{1}{3}\right)}$

22. An ensemble of N three level system with energies $\varepsilon = -\varepsilon, 0, +\varepsilon_0$ is in thermal equilibrium at temperature T. Let $\beta = (k_B T)^{-1}$. The free energy of the system at high temperature (i.e., $x = \beta \varepsilon_0 \ll 1$) is approximately

(a) $-N k_B T x^2$ (b) $-N k_B T\left[\ln 2 + \frac{x^2}{2}\right]$

(c) $-N k_B T\left[\ln 3 + \frac{x^2}{3}\right]$ (d) $-N k_B T \ln 3$

23. Consider a system of 2 identical particles each of which can be in any one of three single particle states. If the particles are Bosons, the number of states of the system is

(a) 9 (b) 3 (c) 6 (d) 1

24. A thermas bottle containing tea is vigorously shaken and thereby the temperature of tea rises, regarding the tea as a system

(a) $\delta Q = 0$, δW = positive, dU = negative (b) $\delta Q = 0$, δW = negative, dU = positive

(c) $\delta Q = 0$, δW = positive, dU = positive (d) $\delta Q = 0$, δW = negative, dU = negative

25. A solid object has a density P, mass M and coefficient of linear expansion α. At pressure P the heat capacitor $C_p - C_v$ are related by

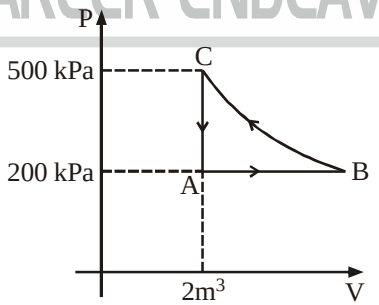
(a) $C_p - C_v = \frac{3\alpha M P}{\rho}$ (b) $C_p - C_v = \frac{3}{2}\frac{\alpha M P}{\rho}$

(c) $C_p - C_v = 0$ (d) $C_p - C_v = \frac{\alpha M P}{\rho}$

26. Two molar of hydrogen gas at standard temperature (T_0) and pressure (P_0) are contained in a cylinder with a movable piston. The walls of cylinder and also the piston are insulated, if the gas is compressed to one third of its original volume, the pressure of the gas will be

(a) $2^{5/3}P_0$ (b) $2^{7/5}P_0$ (c) $3^{7/5}P_0$ (d) $3^{-5/3}P_0$

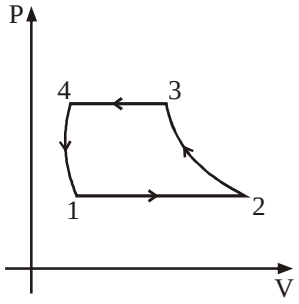
27. A constant amount of an ideal gas undergoes the cyclic process ABCD in the P-V diagram shown in the below figure. The path BC is isothermal which of the following is correct ?



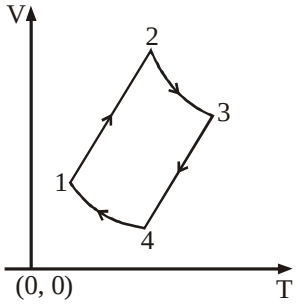
1. The volume of the gas at B is 5 m^3
2. There is no change in the internal energy of the gas in the process BC
3. The temperature will rise in the process CA and fall in the process AB
4. Workdone during complete cycle is 6×10^5 J

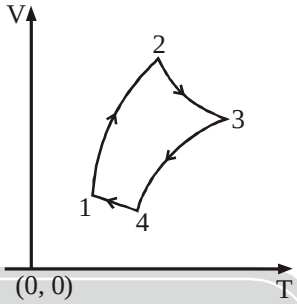
(a) 3 and 4 (b) 1 and 2 (c) 1, 2 and 3 (d) 1, 2, 3 and 4

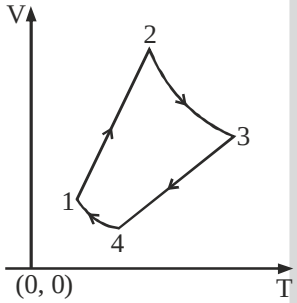
28. An ideal gas undergoes a cyclic process $1 \to 2 \to 3 \to 3$ depicted on P-V diagram where the process $1 \to 2$ and $3 \to 4$ all isobaric and $2 \to 3$ and $4 \to 1$ are adiabatic.

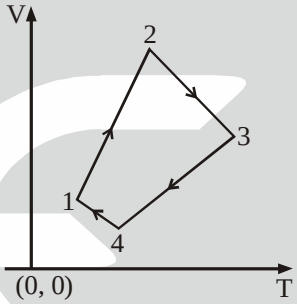


Consider the following diagram on V-T plane, which one is correct ?

(a)


(b)


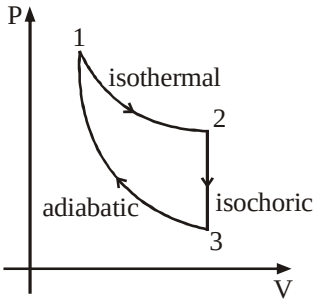
(c)


(d)


29. Mean free path of cosmic ray proton in water at 4 °C is λ if water cooled at 0 °C, then change in mean free path in water

(a) will be positive (b) will be negative (c) will be zero (d) cannot be determined

30. The three processes in a thermodynamics cycle is shown in figure. Workdone by the ideal gas in the cycle is 10 J. The internal energy decrease by 20 J in isochoric process, workdone by gas in adiabatic process is –20 J. Then, the net change in the internal energy in the cycle is



(a) 30 J (b) 0 J (c) –30 J (d) 20 J

Section-B : Multiple Select Questions (MSQ)

Q.31 to Q.40: Carry 2 Marks each.

31. A particle of mass m confined to move in the following one-dimensional potential:

$$V(x)=\begin{cases}0 & \text{for } 0<x<a\\ \infty & \text{otherwise}\end{cases}$$

The wave function of the particle at $t = 0$, is given by

$$\psi(x,t=0)=A\sin\frac{5\pi x}{a}\cos\frac{2\pi x}{a}$$

(a) Probabilty of finding the particle in the second state of the particle is 1/2.
(b) Probabilty of finding the particle in the third state of the particle is 1/2.
(c) Probability of finding the paticle in the seventh state of the particle is 1/2.
(d) The energy of the particle in the given state is $\frac{29h^2}{8ma^2}$.

32. Suppose ψ_{nlm} be the eigenfunction of the Hamiltonian operator of the hydrogen atom where n,l,m are principal, orbital and magnetic quantum number respectively. Which of the following wavefunctions is/are an eigenfunction of L^2 operator? (a,b,c are constants)

(a) $a\psi_{320}+b\psi_{321}+c\psi_{32-2}$ (b) $a\psi_{421}+b\psi_{420}+c\psi_{42-2}$

(c) $a\psi_{211}+b\psi_{311}+c\psi_{410}$ (d) $a\psi_{322}+b\psi_{320}+c\psi_{310}$

33. A set of five possible wave functions is given, where L is a positive real number.

(i) $\psi_1(x)=Ae^{-x}$ for all x (ii) $\psi_2(x)=A\cos x$ for all x

(iii) $\psi_3(x)=\begin{cases}Ae^{x} & 0\le x\le L\\ 0 & \text{otherwise}\end{cases}$ (iv) $\psi_4(x)=\begin{cases}A & -L\le x\le L\\ 0 & \text{otherwise}\end{cases}$

(v) $\psi_5(x)=\begin{cases}Ax & x\ge L\\ 0 & \text{otherwise}\end{cases}$

Which of the five possible wave functions is/are normalizable?

(a) $\psi_2(x)$ (b) $\psi_3(x)$ (c) $\psi_4(x)$ (d) $\psi_5(x)$

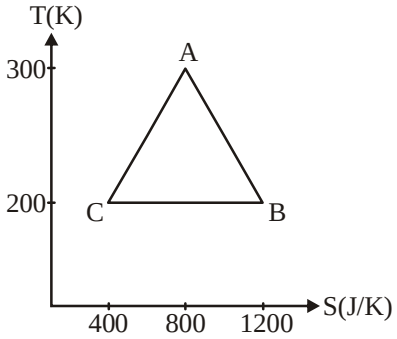
34. Suppose A_n be the area enclosed by the n^{th} orbit in a hydrogen atom. The graph of $\ln\left(\frac{A_n}{A_1}\right)$ against $\ln(n)$

(a) will pass through the origin
(b) will be a straight line with slope 4
(c) will be a monotonically increasing nonlinear curve
(d) will be a monotonically decreasing nonlinear curve

35. An observer S who lives on the x-axis sees a flash of red light at $x = 1210$ m, then after 4.96μs he sees a flash of blue at $x = 480$ m. Another observer S' records the events as occuring at the same place.

(a) The velocity of the observer S' relative to observer S, is -0.49c.
(b) The velocity of the observer S' relative to observer S, is -0.71c.
(c) The time interval between the two flashes measured in S' frame, is 4.32μs.
(d) The time interval between the two flashes measured in S' frame, is 2.45μs.25.

36. A reversible engine cycle is shown in figure (T-S diagram). Find out the incorrect statement(s)-

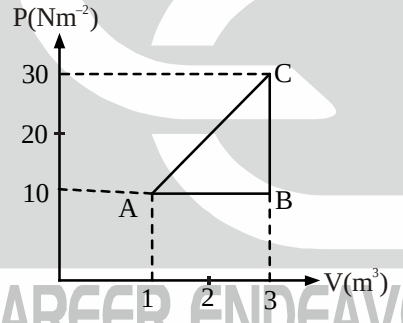


(a) The efficiency of engine is $\frac{1}{5}$.
(b) Heat taken by the engine is 10^5 J.
(c) Work done by the engine is 4×10^4 J
(d) The efficiency of engine is $\frac{1}{3}$.

37. Find out the correct statements -

(a) In a first order phase transition at the transitioni temperature, specific heat of the system diverges and it's entropy has finite discontinuity.
(b) Across a first order phase transition, the Gibb's free energy is a continuous function of the temperature but it's derivative is discontinuous.
(c) In a micro-canonical ensemble N and T both vary.
(d) In order to attain thermal equilibrium at a fixed volume, the system minimises it's Gibb's free energy $(G = E - TS + PV)$.

38. An ideal gas is taken round a cyclic process ABCA. If the internal energy of the gas at point A is assumed zero while at B it is 50 J, and the heat absorbed by the gas in the process BC is 90 J, then-



(a) Internal energy of the gas at point C is 140 J.
(b) Heat absorbed by the gas in process AB is 70 J.
(c) Heat absorbed by the gas in the process CA is 180 J.
(d) Net work done in complete cycle ABCD is 20 J

39. In a hypothetical thermodynamic process, internal energy of an ideal gas varies with volume as $U = \alpha V^{\beta}$ where α and β are constants. If the internal energy of the gas increases by ΔU and W is the work done, then

(a) $P = (\gamma - 1)\alpha V^{\beta-1}$ (b) $W = \frac{\gamma}{\beta}\Delta U$ (c) $P = \gamma\alpha V^{\beta}$ (d) $W = \frac{(\gamma-1)}{\beta}\Delta U$

(P is pressure and γ is adiabatic exponent).

40. Which of the following process can be made reversible with help of refrigerator

(a) constant pressure process
(b) constant volume process
(c) constant PV^n process
(d) none of these

Section-C : Numerical Answer Type (NAT)

Q.41 to Q.50: Carry 1 Mark each.

41. Light described by the equation $E = (100\,V/m)\left[\sin^3\left(1\times10^{15}\,s^{-1}\right)t\right]$ is incident on a metal surface having work function 1 *eV*. The maximum kinetic energy of the emitted photoelectrons will be _____*eV.*

42. A particular radioactive atom has a half life of days 10 days. In 30 days, the probability that the atom will remain undecayed (in percentage) is _____

43. The difference of energy between $n = 2$ and $n = 1$ level of a particle in a one dimensional linear harmonic oscillator is 6 units of energy. In the same units of energy, the difference of energy between $n = 3$ and $n = 2$ level, is _____

44. A beam of 100 particles are sent towards a potential step (at $x = 0$) of 5 eV high. If only 4 particles are reflected back from the boundary of the potential step, then the energy of each particle, will be (in eV) _____

45. The degenaracy of the $n = 4$ level for an electron, moving in a three dimensional isotropic harmonic oscillator will be _____

46. A reversible Carnot's engine converts $\frac{1}{6}$th of heat into work. When the temperature of the sink is reduced by 62°C, the efficiency of the engine is doubled. the temperature of source is _____ K.

47. A system consists of 10^{24} gas atoms and is at a temperature of 300 K. Assuming that there is no interatomic energy in the system, it's total internal energy (in kJ) is _____ (up to first decimal place).

48. Steam at 100°C is mixed with 1500 gm of water at 15°C so that the final temperature of the mixture is 80°C. The mass of steam (in gram) is _____. (Given latent heat of vaporisation = 540 cal/gm and specific heat of water = 1 cal/gm °C)

49. The vapor pressure P (in mm of Hg) of a solid, at temperature T, is expressed by $\ln P = 23 - \frac{3863}{T}$ and that of it's liquid phase by $\ln P = 19 - \frac{3063}{T}$. The triple point (in kelvin) to the material is _____.

50. An ideal Carnot's refrigerator freezes ice cubes at the rate of 5 gm/sec starting with water at the freezing point. Energy is given off to the room at 30°C. If the fusion energy of ice is 320 J/gm, the rate at which energy is expelled to the room is _____ kJ/s

(Up to two decimal places).

Q.51 to Q.60: Carry 2 Marks each.

51. X-rays of 10 *keV* energy is incident on a free electron and get scattered in a direction perpendicular with respect to the direction of the incident radiation resulting in maximum wavelength shift. The kinetic energy transferred to the recoiling electron by the incident photons is _____ *keV*.

52. Six identical non-interacting particles each of mass *m*, are confined inside a 2-D square box of side *a*. If each state obtained from the solution of the Schrodinger equation is occupied by two particles, then the ground state energy of the system will be (in the units of $\frac{h^2}{mL^2}$) _____

53. Positronium atom is a hydrogen-like atom that consists of a positron and an electron. The wavelength of the first Balmer line for positronium is (Given: Wavelength of the first Balmer line for hydrogen is 6563 A^0) (in $\boldsymbol{A^0}$) _____

54. Two rockets of rest length L_0 are moving along each other with same velocity 0.5c. The length of the one rocket w.r.t the other rocket will be (in terms of L_0) _____

55. A muon has a lifetime 2μs in its rest frame. It is created 100 km above earth and move towards the earth at a speed 0.99c. The distance above the ground at which the muon will decay, is (in km) _____

56. A cubically shaped vessel 20 cm on a side contains diatomic H_2 gas at a temperature of 300 K each H_2 molecule contains of two hydrogen atom with mass 1.66×10^{-24} g, each separated by $\sim 10^{-8}$ cm. Assume that gas behavier like ideal gas. Ignore the vibrational degree of freedom then the average velocity of rotation of the molecule around axis which is perpendicular bisector of the line joining two atoms is _____ $\times 10^{13}$ /s ($K = 1.38 \times 10^{-23}$ J/K).

57. Two kg of air is heated at constant pressure of 200 kPa to 500 ºC, the entropy change if the initial volume is 0.8 m^3 is _____ kJ/K.

58. 30 mole of nitrogen gas is kept in canister the pressure dropped to 75 % of its original value and the temperature dropped to 27 ºC. Assuming nitrogen to be an ideal gas, the amount of nitrogen that has leaked out is _____

59. A certain diatomic gas has the same specific heat as an ideal gas but a slightly different equation of state : $PV = R(T + \alpha T^2)$, $\alpha = 0.001\ K^{-1}$. The temperature of the gas is raised from $T_1 = 300$ K to T_2 at constant pressure it is found that workdone on the gas is 70 % higher than what would be an ideal gas, the temperature T_2 is _____ K.

60. A carnot engine is made to operate as a refrigerator, this refrigerator is used to freeze water 0 ºC to ice at 0 ºC and the heat from the working substance is discharge into a large tank containing water at 34 ºC. The latent heat of fusion of ice is 334×10^3 J/kg. The minimum amount of work required to freez 3 kg of water is close to _____ $\times 10^3$ J.

***** END OF QUESTION PAPER *****

Space for Rough Work

IIT-JAM PHYSICA-PH

TEST SERIES - 2

(Thermodynamics + Modern Physics)

Date : 08-01-2017

Booklet: B

ANSWER KEY

Section-A : Multiple Choice Questions (MCQ)

1. (a)	**2.** (b)	**3.** (d)	**4.** (c)	**5.** (b)
6. (d)	**7.** (c)	**8.** (b)	**9.** (a)	**10.** (a)
11. (b)	**12.** (d)	**13.** (a)	**14.** (b)	**15.** (c)
16. (d)	**17.** (b)	**18.** (c)	**19.** (c)	**20.** (a)
21. (b)	**22.** (d)	**23.** (c)	**24.** (b)	**25.** (a)
26. (d)	**27.** (b)	**28.** (c)	**29.** (a)	**30.** (b)

Section-B : Multiple Select Questions (MSQ)

31. (b),(c),(d)	**32.** (a),(b),(c)	**33.** (b),(c)	**34.** (a),(b)
35. (a),(c)	**36.** (b),(d)	**37.** (a),(b)	**38.** (a),(c)
39. (a),(d)	**40.** (a), (b), (c)		

Section-C : Numerical Answer Type (NAT)

41. (0.95 to 1.00)	**42.** (12.5)	**43.** (6)	**44.** (9)
45. (30)	**46.** (372)	**47.** (12.4)	**48.** (1.75)
49. (200)	**50.** (1.78)	**51.** (0.36 to 0.39)	**52.** (3)
53. (13126)	**54.** (0.6)	**55.** (95.8)	**56.** (3.2)
57. (2.040)	**58.** (24)	**59.** (400)	**60.** (125)