NEET PHYSICS 2018-19 - Chennai

Periodic Test : 11 **Test ID :** 023

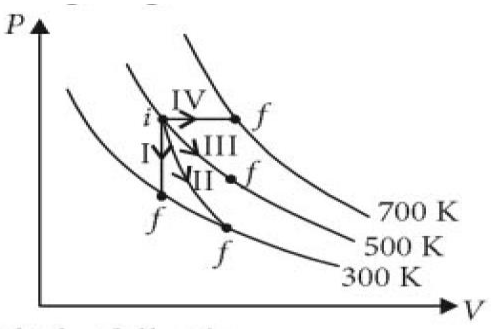
Number of questions: 150 **Test date: 31.03.2019**

Name: _____ **Time**: 3HRS

ID No: _____

Negative Marks : 4 marks for correct attempt & 1 mark deducted for every wrong attempt.

1. Thermodynamic processes are indicated in the following diagram



Match the following

	Column -1	Column-2
P.	Process I	Adiabatic
Q.	Process II	Isobaric
R.	Process III	Isochoric
S.	Process IV	Isothermal

(a) P->C, Q->A, R->D, S->B
(b) P->C, Q->D, R->B, S->A
(c) P->D, Q->B, R->A, S->C
(d) P->A, Q->C, R->D, S->B

2. A Carnot engine having an efficiency of 1/10 as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is
(a) 90 J
(b) 99 J
(c) 100 J
(d) 1 J

3. A gas mixture consists of 2 moles of O_2, and 4 moles of Ar at temperature T. Neglecting all vibrational modes, the total internal energy of the system is
(a) 15 RT
(b) 9 RT
(c) 11 RT
(d) 4 RT

4. One mole of an ideal monatomic gas undergoes a process described by the equation PV^3= constant. The heat capacity of the gas during this process is
(a) 3/2 R
(b) 5/2 R
(c) 2R
(d) R

5. The temperature inside a refrigerator is t_2°C and the room temperature is t_1 °C. The amount of heat delivered to the room for each joule of electrical energy consumed ideally will be
(a) $\frac{t_1}{t_1-t_2}$
(b) $\frac{t_1+273}{t_1-t_2}$
(c) $\frac{t_2+273}{t_1-t_2}$
(d) $\frac{t_1+t_2}{t_1+273}$

6. A given sample of an ideal gas occupies a volume *V* at a pressure *P* and absolute temperature *T*. The mass of each molecule of the gas is *m*. Which of the following gives the density of the gas?
   (a) P/(Kt)
   (b) Pm/(kT)
   (c) P/(kTV)
   (d) MkT

7. A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process until its volume is again reduced to half. Then
   (a) Compressing the gas isothermally or adiabatically will require the same amount of work.
   (b) Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.
   (c) Compressing the gas isothermally will require more work to be done.
   (d) Compressing the gas through adiabatic process will require more work to be done.

8. The molecules of a mass of a gas have r.m.s. velocity of 200 m s^{-1} at 27°C and 1.0X10^5 N m^{-2} pressure. When the temperature and pressure of the gas are respectively, 127°C and 0.05X10^5 N m^{-2}, the r.m.s. velocity of its molecules in m s^{-1} is
   (a) $\frac{100\sqrt{2}}{3}$
   (b) $\frac{100}{3}$
   (c) $100\sqrt{2}$
   (d) $\frac{400}{\sqrt{3}}$

9. A refrigerator works between 4°C and 30°C. It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is (Take 1 cal = 4.2 Joules)
   (a) 236.5 W
   (b) 2365 W
   (c) 2.365 W
   (d) 23.65 W

10. An ideal gas is compressed to half its initial volume by means of several processes. Which of the process results in the maximum work done on the gas?
   (a) Isochoric
   (b) Isothermal
   (c) Adiabatic
   (d) Isobaric

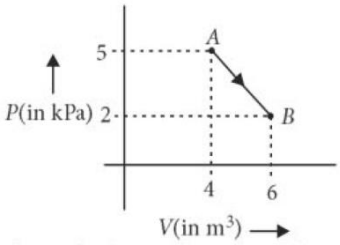
11. Two vessels separately contain two ideal gases A and B at the same temperature, the pressure of A being twice that of B. Under such conditions, the density of A is found to be 1.5 times the density of B. The ratio of molecular weight of A and B is
   (a) 2
   (b) 1/2
   (c) 2/3
   (d) ¾

12. The coefficient of performance of a refrigerator is 5. If the temperature inside freezer -20°C, is the temperature of the surroundings to which it rejects heat is
   (a) 11°C
   (b) 21°C
   (c) 31°C
   (d) 41°C

13. The ratio of the specific heats $\frac{C_p}{C_v} = \gamma$ in terms of degrees of freedom (n) is given by
    (a) $\left(1+\frac{2}{n}\right)$
    (b) $\left(1+\frac{n}{2}\right)$
    (c) $\left(1+\frac{1}{n}\right)$
    (d) $\left(1+\frac{n}{3}\right)$

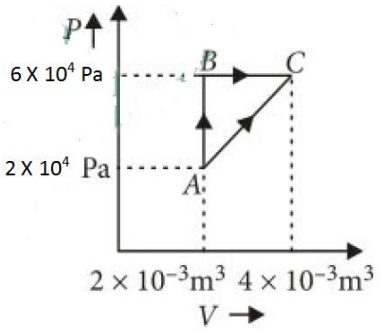
14. A Carnot engine, having an efficiency of as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is
    (a) 90 J
    (b) 1 J
    (c) 100 J
    (d) 99

15. One mole of an ideal diatomic gas undergoes a transition from A to B along a path AB as shown in the figure.



    The change in internal energy of the gas during the transition is
    (a) 20 J
    (b) -12 kJ
    (c) 20 kJ
    (d) -20 Kj

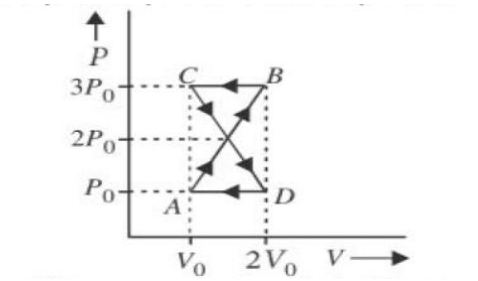
16. Figure below shows two paths that may be taken by a gas to go from a state A to a state C.
    In process AB, 400 J of heat is added to the system in process BC, 100 J of heat is added to system.
    The heat absorbed by the system in the AC will be



    (a) 460 J
    (b) 300 J
    (c) 380 J
    (d) 500 J

17. A monatomic gas at a pressure P, having a volume V expands isothermally to a volume 2V and then adiabatically to a volume 16V. The final pressure of the gas is
    (Take γ = 5/3)
    (a) 64P
    (b) 32P
    (c) P/64
    (d) 16P

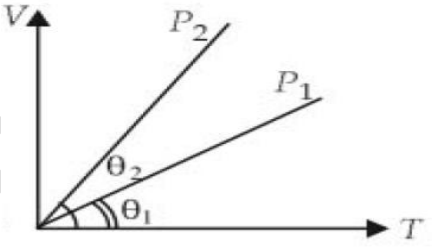
18. A thermodynamic system undergoes cyclic process *ABCDA* as shown in figure. The work done by the system in the cycle is



(a) P_0V_0
(b) $2P_0V_0$
(c) $P_0V_0 / 2$
(d) Zero

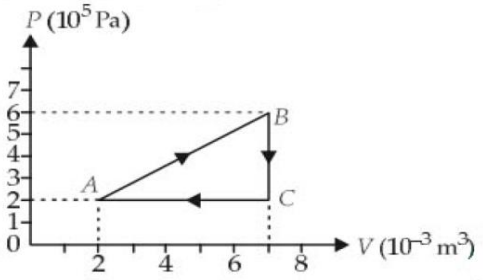
19. The mean free path of molecules of a gas, (radius r) is inversely proportional to
(a) r^3
(b) r^2
(c) r
(d) $\sqrt{r}$

20. In the given (*V*-*T*) diagram, what is the relation between pressures P_1 and P_2?



(a) $P_2 < P_1$
(b) Cannot be predicted
(c) $P_2 = P_1$
(d) $P_2 > P_1$

21. A gas taken through the cycle A ->B -> C -> A, as shown. What is the net work done by the gas?



(a) Zero
(b) -2000 J
(c) 2000 J
(d) 1000 J

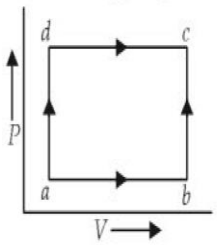
22. During an adiabatic process, the pressure of a gas found to be proportional to the cube of its temperature. The ratio of $\frac{C_p}{C_v}$ for the gas is
(a) 5/3
(b) 3/2
(c) 4/3
(d) 2

23. The amount of heat energy required to raise the temperature 1 g of Helium at NTP, from T_1K to T_2K is

(a) $\frac{3}{4}N_a k_B(T_2 - T_1)$ (b) $\frac{3}{4}N_a k_B\left(\frac{T_2}{T_1}\right)$

(c) $\frac{3}{8}N_a k_B(T_2 - T_1)$ (d) $\frac{3}{2}N_a k_B(T_2 - T_1)$

24. A system is taken from state a to state c by two paths adc and abc as shown in the figure. The internal energy as a is U_a=10 J. Along the path adc the amount of heat absorbed dQ_1=50J and the work obtained dW_1=20 J whereas along the path abc the heat absorbed dQ_2=36 J. The amount of work along the path abc is



(a) 10 J (b) 12 J (c) 36 J (d) 6 J

25. Which of the following relations does not give the equation of an adiabatic process, where terms have their usual meaning?
(a) $P^{1-\gamma}\,T^{\gamma}$= constant
(b) $P\,V^{\gamma}$= constant
(c) $TV^{\gamma-1}$ = constant
(d) $P^{\gamma}\,T^{1-\gamma}$= constant

26. The efficiency of a Carnot engine operating with reservoir temperature of 100°C and -23°C will be
(a) $\frac{373+250}{373}$
(b) $\frac{373-250}{373}$
(c) $\frac{100+3}{100}$
(d) $\frac{100-23}{100}$

27. A sample of gas expands from volume V_1 to V_2. The amount of work done by the gas is greatest, when the expansion is
(a) adiabatic
(b) equal in all cases
(c) isothermal
(d) isobaric.

28. The value of critical temperature in terms of van der Waals' constant α and b is given by
(a) $T_c = \frac{8\alpha}{27Rb}$
(b) $T_c = \frac{27\alpha}{8Rb}$
(c) $T_c = \frac{\alpha}{2Rb}$
(d) $T_c = \frac{\alpha}{27Rb}$

29. An ideal gas, undergoing adiabatic change, has which of the following pressure temperature relationship?
(a) $P^{\gamma}\,T^{1-\gamma}$= constant
(b) $P^{1-\gamma}\,T^{\gamma}$= constant
(c) $P^{\gamma-1}\,T^{\gamma}$= constant
(d) $P^{\gamma}\,T^{\gamma-1}$= constant

30. A diatomic gas initially at 18°C is compressed adiabatically to one eighth of its original volume. The temperature after compression will be
(a) 395.4°C
(b) 144°C
(c) 18°C
(d) 887.4°C

31. At 0 K which of the following properties of a gas will be zero?
(a) Vibrational energy
(b) Density
(c) Kinetic energy
(d) Potential energy

32. An ideal Carnot engine, whose efficiency is 40%, receives heat at 500 K. If its efficiency is 50%, then the intake temperature for the same exhaust temperature is
    (a) 800 K
    (b) 900 K
    (c) 600 K
    (d) 700 K

33. In an adiabatic change, the pressure and temperature of a monatomic gas are related as
    $P \propto TC$, where C equals
    (a) 3/5
    (b) 5/3
    (c) 2/5
    (d) 5/2

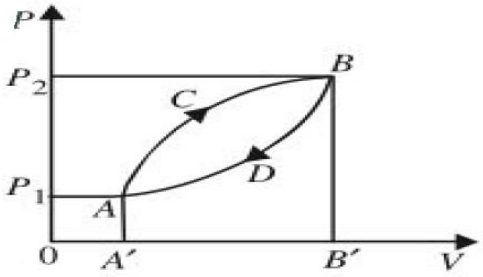
34. Which of the following is not thermodynamical function?
    (a) Enthalpy
    (b) Work done
    (c) Gibb's energy
    (d) Internal energy

35. 110 joule of heat is added to a gaseous system whose internal energy is 40 J, then the amount of external work done is
    (a) 150 J
    (b) 70 J
    (c) 110 J
    (d) 40 J

36. An ideal gas A and a real gas B have their volume increased from V to 2V under isothermal conditions. The increase in internal energy
    (a) Will be same in both A and B
    (b) Will be same zero in both the gases
    (c) Of B will be more than that of A
    (d) Of A will be more than that of B

37. The number of translation degrees of freedom for a diatomic gas is
    (a) 2
    (b) 3
    (c) 5
    (d) 6

38. A thermodynamic system is taken from state A to B along ACB and is brought back to A along BDA as shown in the PV diagram. The network done during the complete cycle is given by the area



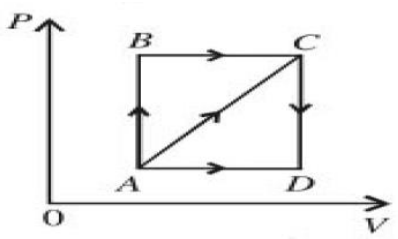
    (a) $P_1ACBP_2P_1$
    (b) ACBB'A'A
    (c) ACBDA
    (d) ADBB'A'A

39. If for a gas, $R/C_V = 0.67$, this gas is made up of molecules which are
    (a) Diatomic
    (b) Mixture of diatomic and polyatomic molecules
    (c) Monoatomic
    (d) Polyatomic

40. For hydrogen gas C_P-C_V=α and for oxygen gas C_P-C_V=b, so the relation between α and b is given by
    (a) α = 16b
    (b) 16b = α
    (c) α = 4b
    (d) α = b

41. Three containers of the same volume contain three different gases. The masses of the molecules are m_1, m_2 and m_3 and the number of molecules in their respective containers are N_1, N_2, and N_3. The gas pressure in the containers are P_1, P_2 and P_3 respectively. All the gases are now mixed and put in one of these containers. The pressure P of the mixture will be
    (a) $P < (P_1+P_2+P_3)$
    (b) $P= (P_1+P_2+P_3)/3$
    (c) $P= (P_1+P_2+P_3)$
    (d) $P > (P_1+P_2+P_3)$

42. A thermodynamic process is shown in the figure. The pressure and volumes corresponding to some points in the figure are
    $P_A= 3 \times 10^4$ Pa; $V_A = 2 \times 10^{-3}$ m^3
    $P_B= 8 \times 10^4$ Pa; $V_B = 5 \times 10^{-3}$ m^3
    In the process AB, 600 J of heat is added to the system and in process BC, 200 J of heat is added to the system. The change in internal energy of the system is process AC would be



    (a) 560 J
    (b) 800 J
    (c) 600 J
    (d) 640 J

43. Relations between pressure (P) and energy (E) of a gas is
    (a) P = (2/3) E
    (b) P = (1/3) E
    (c) P = E
    (d) P = 3E

44. One mole of an ideal gas requires 207 J heat to raise the temperature by 10 K when heated at constant pressure. If the same gas is heated at constant volume raise the temperature by the same 10 K, the heat required is (Given the gas constant R=8.3 J/mole K)
    (a) 198.7 J
    (b) 29 J
    (c) 215.3 J
    (d) 124 J

45. According to kinetic theory of gases, at absolute zero of temperature
    (a) Water freezes
    (b) Liquid helium freezes
    (c) Molecular motion stops
    (d) Liquid hydrogen freezes

46. For a certain gas the ration of specific heats is given be $\gamma = 1.5$. For this gas
    (a) $C_V = 3R/J$
    (b) $C_P = 3R/J$
    (c) $C_P = 5R/J$
    (d) $C_V = 5R/J$

47. A polyatomic gas with n degrees of freedom has a mean energy per molecule given by
    (a) nkT / N
    (b) nkT / 2N
    (c) nkT / 2
    (d) 3kT/2

48. At constant volume temperature is increased then
    (a) collision on walls will be less
    (b) number of collisions per unit time will increase
    (c) collisions will be in straight lines
    (d) collisions will not change

49. Two containers A and B are partly filled with water and closed. The volume of A is twice that of B and it contains half the amount of water in B. If both are at the same temperature, the water vapour in the containers will have pressure in the ratio of
    (a) 1 : 2
    (b) 1 : 1
    (c) 2 : 1
    (d) 4 : 1

50. First law of thermodynamics is consequence of conservation of
    (a) Work
    (b) Energy
    (c) Heat
    (d) All of these