SUMMARY

⇒ Thermal equilibrium, teroth law of thermodynamics, Concept of temperature.

⇒ Heat, work and internal energy. First law of thermodynamics.

⇒ Second law of thermodynamics, reversible and irrevessible processes.
Isothermal and adiabatic process.

⇒ Carnot engine and its efficency Refrigerators.

⇒ $\frac{C-0}{100^0} = \frac{F-32}{180^0} \Leftrightarrow \frac{\Delta C}{100^0} = \frac{\Delta F}{180^0}$

⇒ $w = P\,\Delta V$ (Isothesmal process)

$\mu RT \,\ell n \frac{v_2}{v_1}$ (Isothesmal process)

$PV = \text{Const}$ (Isothesmal process)

$P\,v^{\gamma} = \text{Const}$ (adiabasic process)

$P^{1-\gamma}\,T^{\gamma} = \text{Const}$

$TV^{\gamma-1} = \text{Constant}$

$r = \frac{cp}{cv}$

Monoatomic gases $C_v = \frac{3}{2}R, \; = C_p = \frac{5}{2}R, \; \gamma = 1.67$

Diatomic gases $C_v = \frac{5}{2}R, \; C_p = \frac{7}{2}R, \; \gamma = 1.4$

Polgatomic gases $C_v = \frac{7R}{2}, \; C_p = \frac{9R}{2}, \; \gamma = 1.4$

$W = \frac{1}{\gamma-1}(P_1\,V_1 - P_2\,V_2)$ (adiabafic Process)

$= \frac{mR\,(T_1 - T_2)}{\gamma-1}$

⇒ $\Delta Q = \Delta u + \Delta W$ (First law of thermodynamics)

$\Delta Q = \Delta U = \mu Cv\Delta t$ $(V = \text{Const})$

$\Delta Q = \mu Cp\Delta t$ $(P = \text{Const})$

$\Delta u = 0$ (isothesmal process cyelic process)

⇒ Coefricent of Performance of refrigesatos

$n = \frac{W}{Q_1}$

$= \frac{Q_1 - Q_2}{Q_1}$

$= \frac{T_1 - T_2}{T_1}$

⇒ Coefcient of performance of refrigetors.

$\alpha = \frac{Q_2}{w}$

$= \frac{Q_2}{Q_1 - Q_2}$

$= \frac{T_2}{T_1 - T_2}$

⇒ I deal gas $Cp - Cv = R$

1. A difference of temperature of 25^0 C is equivalent to a difference of

(A) 72^0 F (B) 45^0 F (C) 32^0 F (D) 25^0 F

2. What is the value of absolute temperature on the Celsius Scale ?

(A) -273.15^0 C (B) 100^0 C (C) -32^0 C (D) 0^0 C

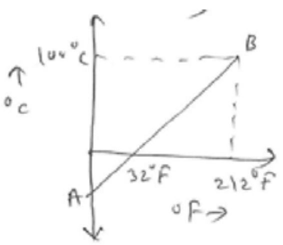
3. The temperature of a substance increases by 27^0C What is the value of this increase of Kelvin scale?

(A) 300K (B) 2-46K (C) 7 K (D) 27 K

4. At Which temperature the density of water is maximum?

(A) 4^0 F (B) 42^0 F (C) 32^0 F (D) 39.2^0 F

5. The graph AB Shown in figure is a plot of a temperature of a body in degree Fahrenhit than slope of line AB is



(A) $\frac{5}{9}$ (B) $\frac{9}{5}$ (C) $\frac{1}{9}$ (D) $\frac{3}{9}$

6. The temperature on celsius scale is 25^0C What is the corresponding temperature on the Fahrenheit Scale?

(A) 40^0F (B) 45^0F (C) 50^0F (D) 77^0F

7. The temperature of a body on Kelvin Scale is found to be x.K.when it is measured by Fahrenhit thesmometes. it is found to be x^0F, then the value of x is .

(A) 313 (B) 301.24 (C) 574-25 (D) 40

8. A Centigrade and a Fahrenhit thesmometes are dipped in boiling wates-The wates temperature is lowered until the Farenhit thesmometes registered 140^0 what is the fall in thrmometers

(A) 80^0 (B) 60^0 (C) 40^0 (D) 30^0

9. A uniform metal rod is used as a bas pendulum. If the room temperature rises by 10^0C and the efficient of line as expansion of the metal of the rod is, $2\times10^{-6}\,0_C^{-1}$ what will have percentage increase in the period of the pendulum ?

(A) -2×10^{-3} (B) 1×10^{-3} (C) -1×10^{-3} (D) 2×10^{-3}

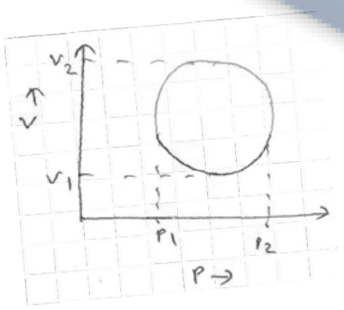
10. A gas expands from 1 litre to 3 litre at atmospheric pressure. The work done by the gas is about

(A) 200 J (B) 2 J (C) 300 J (D) 2×10^5J

11. Each molecule of a gas has f degrees of freedom. The radio $\frac{C_P}{C_V}=\gamma$ for the gas is

(A) $1+\frac{f}{2}$ (B) $1+\frac{1}{f}$ (C) $1+\frac{2}{f}$ (D) $1+\frac{(f-1)}{3}$

12. Is the cyclic Process Shown on the V $\rightarrow$ P diagram, the magnitude of the work done is



(A) $\pi\left(\frac{P_2-P_1}{2}\right)^2$ (B) $\pi\left(\frac{V_2-V_1}{2}\right)^2$

(C) $\pi\ (P_2V_2-P_1V_1)$ (D) $\frac{\pi}{4}(P_2-P_1)(V_2-V_1)$

13. If the ratio of specific heat of a gas at Consgant pressure to that at constant volume is γ, the Change in internal energy of the mass of gas, when the volume changes from V to 2V at Constant Pressure p, is

(A) $\frac{PV}{\gamma-1}$ (B) $\frac{R}{\gamma-1}$ (C) PV (D) $\frac{\gamma\,PV}{\gamma-1}$

14. The change in internal energy, when a gas is cooled from 927^0C^3 to 27^0C

(A) 200% (B) 100% (C) 300% (D) 400%

15. For hydrogen gas Cp - Cv = a and for oxygen gas Cp - Cv = b, The relation between a and b is given by

(A) a = 4b (B) a = b (C) a = 16b (D) a = 8b

16. In a thermodynamic process, pressure of a fixed mass of a gas is changed in such a manner that the gas release 20J of heat and 8J of work has done on the gas- If the inifial internal energy of the gas was 30j, then the final internal energy will be

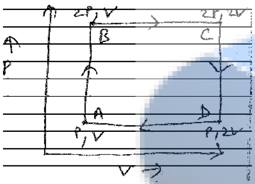
(A) 58 J (B) 2 J (C) 42 J (D) 18 J

17. If for a gas $\frac{cp}{cv} = 1.67$, this gas is made up to molecules which are

(A) diatomic (B) Polytomic

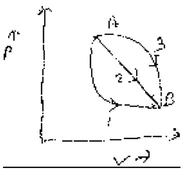
(C) monoatomic (D) mixnese of diatomic and polytomic molecules

18. An ideal monoatomic gas is taken around the cycle ABCDA as Shown in the $P \rightarrow V$ diagram. The work done during the cycle is given by



(A) PV (B) $\frac{1}{2}$ PV (C) 2 PV (D) 4 PV

19. A given mass of a gas expands from state A to B by three different paths 1, 2 and 3 as shown in the figure. If W_1,W_2 and W_3 respectively be the work done by the gas along the three paths, then



(A) $W_1>W_2>W_3$ (B) $W_1<W_2<W_3$ (C) $W_1=W_2=W_3$ (D) $W_1<W_2$, $W_1<W_3$

20. One mole of a monoatomic gas $\left(\gamma = \frac{5}{3}\right)$ is mixed with one mole of A diatomic gas $\left(\gamma = \frac{7}{5}\right)$ what will be value of γ for mixture ?

(A) 1-454 (B) 1-4 (C) 1-54 (D) 1-5

21. If du represents the increase in internal energy of a thesmodynamic system and dw the work done by the system, which of the following statement is true ?

(A) du = dw in isothermal process

(B) du = dw in aidabadic process

(C) du = - dw in an aidabadic process

(D) da = - dw in an isothermal process

22. One mole of a monoatomic ideal gas is mixed with one mole of a diatomic ideal gas The molas specific heat of the micture at constant volume is ....

(A) 4 R (B) 3 R (C) R (D) 2R

23. One mole of a monoatomic gas is heate at a constant pressure of 1 atmosphere from 0k to 100 k. If the gas constant R = 8.32 J/mol k the change in internal energy of the gas is approximate ?

(A) 23 J (B) 1.25×10^3 J (C) 8.67×10^3 J (D) 46 J

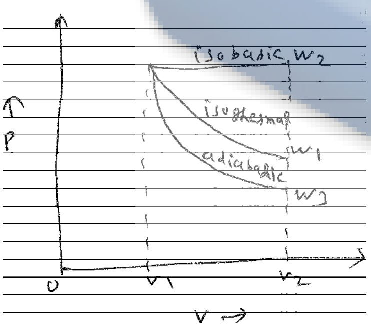
24. A gas mixture consists of 2 mde of oxygen and 4 mole of argon at tempressure T.Neglecting all vibrational modes, the total internal energy of the system is

(A) 11 RT (B) 9 RT (C) 15 RT (D) 4 RT

25. A monoatomic ideal gas, initially at temperature T_1 is enclosed in a cylindes fitted with a frictionless piston. The gas is allowed to expand adiabatically to a temperature T_2 by releasing the piston suddenly If L_1 and L_2 the lengths of the gas colum be fore and afters expansion respectively, then then $\frac{T_1}{T_2}$ is given by

(A) $\left(\frac{L_1}{L_2}\right)^{2/3}$ (B) $\left(\frac{L_2}{L_1}\right)^{2/3}$ (C) $\frac{L_1}{L_2}$ (D) $\frac{L_2}{L_1}$

26. Starting with the same intial Conditions, an ideal gas expands from Volume V_1 to V_2 in three different ways. The Work done by the gas is W_1 if the process is purely isothermal, W_2 if purely isobasic and W_3 if purely adiabatic Then



(A) $W_2>W_1>W_3$ (B) $W_2>W_3>W_1$
(C) $W_1>W_2>W_3$ (D) $W_1>W_3>W_2$

27. In a given process on an ideal gas dw = 0 and dQ < 0. Then for the gas

(A) the volume will increase (B) the pressure will semain constant
(C) the temperature will decrease (D) the temperature will increase

28. Wafer of volume 2 filter in a containes is heated with a coil of 1kw at 27^0C. The lid of the containes is open and energy dissipates at the late of $160\frac{J}{S}$. In how much time tempreture will rise from 27^0C to 77^0C. Specific heat of wafers is $4.2\frac{KJ}{Kg}$

(A) 7 min (B) 6 min 2s (C) 14 min (D) 8 min 20 S

29. 70 calorie of heat are required to raise the temperature of 2 mole of an ideal gas at constant pressure from 30^0C to 35^0C

The amount of heat required to raise the temperature of the same gas through the same range at constant volume is .... calorie.

(A) 50 (B) 30 (C) 70 (D) 90

30. When an ideal diatomic gas is heated at constant pressure, the Section of the heat energy supplied which increases the infernal energy of the gas is..

(A) $\frac{3}{7}$ (B) $\frac{3}{5}$ (C) $\frac{2}{5}$ (D) $\frac{5}{7}$

31. Two cylinders A and B fitted with piston contain equal amounts of an ideal diatomic gas at 300 k. The piston of A is free to move, While that of B is held fixed. The same amount of heat is given to the gas in each cylindes. If the rise in temperature of the gas in A is 30K, then the rise in temperature of the gas in B is.

(A) 30 K (B) 42 K (C) 18 K (D) 50 K

32. An insulated containes containing monoatomic gas of molas mass Mo is moving with a velocity, V.If the container is suddenly stopped, find the change in temperature.

(A) $\frac{Mov^2}{5R}$ (B) $\frac{Mov^2}{4R}$ (C) $\frac{Mov^2}{3R}$ (D) $\frac{Mov^2}{2R}$

33. A Small spherical body of radius r is falling under gravity in a viscous medium. Due to friction the medium gets heated. How does the late of heating depend on radius of body when it attains terminal velocity!

(A) r^2 (B) r^3 (C) r^4 (D) r^5

34. The first law of thermodynamics is concerned with the conservation of

(A) momentum (B) energy (C) mass (D) temperature

35. If heat given to a system is 6 k cal and work done is 6kj. The change in internal energy is .... KJ.

(A) 12.4 (B) 25 (C) 19.1 (D) 0

36. The internal energy change in a system that has absorbed 2 Kcal of heat and done 500J of work is

(A) 7900 J (B) 4400 J (C) 6400 J (D) 8900 J

37. Which of the following is not a thermodynamical function.

(A) Enthalpy (B) Work done

(C) Gibb's energy (D) Internal energy

38. Which of the following is not a thermodynamic co-ordinate.

(A) R (B) P (C) T (D) V

39. The work of 62-25 KJ is performed in order to compress one kilo mole of gas adiabatically and in this process the temperature of the gas increases by 5^0C The gas is ________ R = 8-3 $\frac{J}{molk}$

(A) triatomic (C) monoatomic

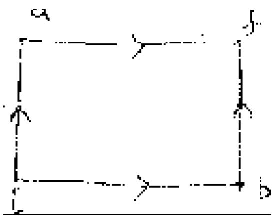
(B) diatomic (D) a mixture of monoatomic and diatomic

40. Cp and Cv denote the specific heat of oxygen per unit mass at constant Pressure and volume respectively, then

(A) cp - cv = $\frac{R}{16}$ (B) Cp - Cv = R

(C) Cp - Cv = 32 R (D) Cp - Cv = $\frac{R}{32}$

41. When a System is taken from State i to State f along the path iaf, it is found that Q = 70 cal and w = 30 cal, along the path ibf. Q=52cal. W atoug the path ibf is



(A) 6 cal (B) 12 cal (C) 24 cal (D) 8 cal

42. One kg of adiatomic gas is at a pressure of $5\times10^5 \frac{N}{m^2}$ The density of the gas is $\frac{5kg}{m^3}$ what is the energy of the gas due to its thermal motion ?

(A) 2.5×10^5 J (B) 3.5×10^5 J (C) 4.5×10^5 J (D) 1.5×10^5 J

43. 200g of water is heated from 25^0C^0 45^0C Ignoring the slight expansion of the water the change in its internal energy is (Specific heat of wafer $1\frac{cal}{9^0C}$)

(A) 33.4 KJ (B) 11.33 KJ (C) 5.57 KJ (D) 16.7 KJ

44. During an adiabatic process, the pressure of a gas ifound to be propostional to the fifth power of its absolute temperature. The radio $\frac{cp}{cv}$ for the gas is

(A) $\frac{4}{5}$ (B) $\frac{3}{4}$ (C) $\frac{5}{4}$ (D) 4

45. One mole of oxygen is heated at constant pressure stasting at 0^0C. How much heat energy in cal must be added to the gas to double its volume ? Take $R = 2\frac{cal}{molk}$

(A) 1938 (B) 1920 (C) 1911 (D) 1957

46. μ moles of a gas filled in a containes at temperature T is in equilibrium inidially - If the gas is compressed slowly and is thesmally to half its initial volume the work done by the atmosphere on the piston is

(A) $-\frac{RT}{2}$ (B) $\frac{\mu RT}{2}$ (C) $\mu RT\, ln(2 - \frac{1}{2})$ (D) $-\mu RT ln_2$

47. Heat capacity of a body depends on the .... as well as on ....

(A) material of the body, its mass
(C) mass of the body, itd temperature
(B) material of the body, its temperature
(D) Volume of the body, its mass

48. In thesmodynamics, the work done by the system is considered .... and the work done on the system is Considered ....

(A) Positive, zero
(B) nagative, Positive
(C) zero, negative
(D) Positive, negative

49. A thesmodynamic system goes from States

(i) P,V to 2P, V (ii) P,V to P, 2V. Then what is work done in the two Cases.

(A) Zero, PV (B) Zero, Zero (C) PV, Zero (D) PV,PV

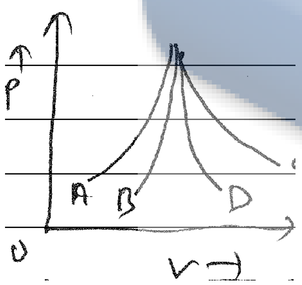
50. For free expansion of the gas which of the following is true ?

(A) Q = 0, W > 0 and μ Eint = -W
(B) W = 0, Q >0 and Δ Eint = Q
(C) W > 0, Q < 0 and Δ Eint = 0
(D) Q = W = 0 and Δ Eint = 0

51. For an adiabatic process involving an ideal gas

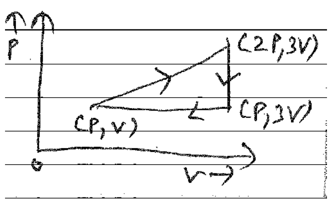
(A) $P^{\gamma-1} = T^{\gamma-1}$ = constant
(B) $P^{1-\gamma} = T^{\gamma}$ = constant
(C) $PT^{\gamma-1}$ = constant
(D) $P^{\gamma-1}T^{\gamma}$ = constant

52. Figure shows four P $\rightarrow$ V diagrams. which of these curves represent. isothermal and adiabatic processes ?



(A) A and C (B) A and B (C) C and D (D) B and D

53. An ideal gas is taken through cyclic process as shown in the figure. The net work done by the gas is

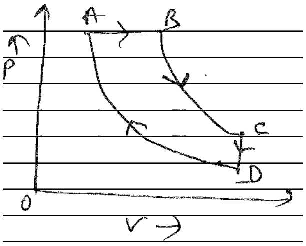


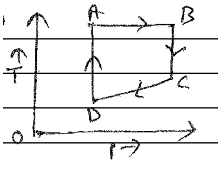
(A) PV (B) 2 PV (C) 3 PV (D) zero

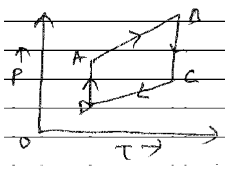
54. μ moles of gas expands from volume V_1 to V_2 at constant temperature T. The work done by the gas is

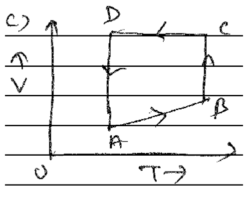
(A) $\mu RT\left(\frac{V_2}{V_1}\right)$ (B) $\mu RT\, ln\left(\frac{V_2}{V_1}\right)$ (C) $\mu RT\left(\frac{V_2}{V_1}-1\right)$ (D) $\mu RT\, ln\left(\frac{V_2}{V_1}+1\right)$

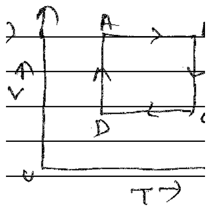
55. A Cyclic Process ABCD is Shown in the P $\rightarrow$ V diagam. which of the following curves represent the same Process ?



(A) 

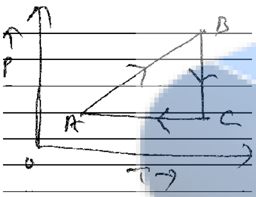
(B) 

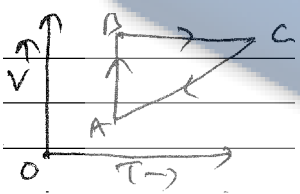
(C) 

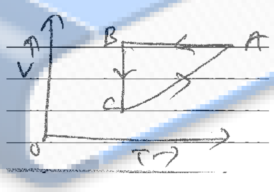
(D) 

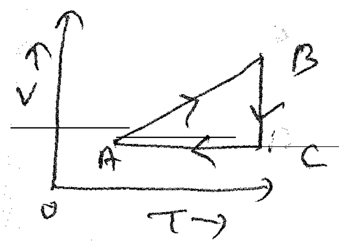
56. A Cyclic process is Shown in the P $\rightarrow$ T diagram.

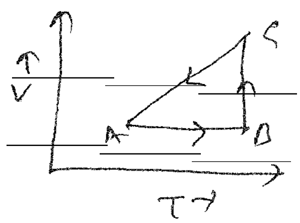
Which of the curve show the same process on a V $\rightarrow$ T diagram ?



(A) 

(B) 

(C) 

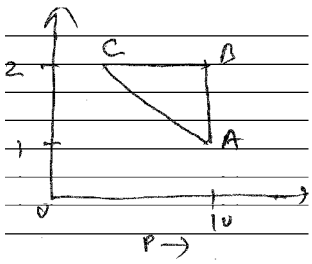
(D) 

57. One mole of an ideal gas $\frac{C_p}{C_v} = \gamma$ at absolute temperature T_1 is adiabatically compressed from an initial pressure P_1 to a final pressure P_2 The resulting temperature T_2 of the gas is given by.

(A) $T_2 = T_1 \left(\frac{p_2}{p_1}\right)^{\frac{\gamma}{\gamma-1}}$ (B) $T_2 = T_1 \left(\frac{p_2}{p_1}\right)^{\frac{\gamma-1}{\gamma}}$

(C) $T_2 = T_1 \left(\frac{p_2}{p_1}\right)^{\gamma}$ (D) $T_2 = T_1 \left(\frac{p_2}{p_1}\right)^{\gamma-1}$

58. An ideal gas is taken through the cycle $A \rightarrow B \rightarrow C \rightarrow A$ as shown in the figure. If the net heat supplied to the gas in the cycle is 5J, the work done by the gas in the process $C \rightarrow A$ is



(A) - 5 J (B) -10 J (C) -15 J (D) - 20 J

59. In anisothermal reversible expansion, if the volume of 96J of oxygen at 27^0C is increased from 70 liter to 140 liter, then the work done by the gas will be

(A) $300\,R\log_e^{(2)}$ (B) $81\,R\log_e^{(2)}$ (C) $200\,R\ell og_{10}^{2}$ (D) $100\,R\log_{10}^{(2)}$

60. For an iso thermal expansion of a Perfect gas, the value of $\frac{\Delta P}{P}$ is equal to

(A) $-\gamma^{\frac{1}{2}}\frac{\Delta V}{V}$ (B) $-\gamma\frac{\Delta V}{V}$ (C) $-\gamma^2\frac{\Delta V}{V}$ (D) $\gamma-\frac{\Delta V}{V}$

61. For an aidabatic expansion of a perfect gas, the value of $\frac{\Delta P}{P}$ is equal to

(A) $-\sqrt{\gamma}\frac{\Delta r}{v}$ (B) $-\frac{\Delta v}{v}$ (C) $-\gamma^2\frac{\Delta v}{v}$ (D) $-\gamma\frac{\Delta v}{v}$

62. If r denotes the ratio of adiabatic of two specific heats of a gas. Then what is the ratio of slope of an adiabatic and isothermal $P \rightarrow V$ curves at their point of intersection ?

(A) $\frac{1}{\gamma}$ (B) γ -1 (C) γ (D) $\gamma + 1$

63. Work done permol in an isothermal ? change is

(A) $RT \log e \frac{v_2}{v_1}$ (B) $RT\log 10\frac{v_2}{v_1}$ (C) $RT\log 10\frac{v_1}{v_2}$ (D) $RT\log e\frac{v_1}{v_2}$

64. The isothermal Bulk modulus of an ideal gas at pressure P is

(A) vP (B) P (C) $\frac{p}{2}$ (D) $\frac{p}{v}$

65. The isothermal bulk modulus of a perfect gas at a normal Pressure is

(A) $1.013\times10^6\frac{N}{m^2}$ (B) $1.013\times10^{-11}\frac{N}{m^2}$ (C) $1.013\times10^5\frac{N}{m^2}$ (D) $1.013\times10^{11}\frac{N}{m^2}$

66. An adiabatic Bulk modulus of an ideal gas at Pressure P is

(A) γP (B) $\frac{p}{\gamma}$ (C) P (D) $\frac{P}{2}$

67. What is an adiabatic Bulk mudulus of hydrogen gas at NTP? r = 1.4

(A) $1.4 \frac{N}{M^2}$ (B) $1.4 \times 10^5 \frac{N}{M^2}$ (C) $1 \times 10^{-8} \frac{N}{M^2}$ (D) $1 \times 10^5 \frac{N}{M^2}$

68. If a quantity of heat 1163.4 J is supplied to one mole of nitrogen gas, at room temprature at constant pressure, then the rise intemperature is $R = 8.31 \frac{J}{m.l.k}$

(A) 28 K (B) 65 K (C) 54 K (D) 40 K

69. One mole of O_2 gas having a Volume equal to 22.4 liter at $0^\circ c$ and 1 atmosiheric Pressure is Compressed isothermally so that its volume reduces to 11.2 lites. The work done in this Process is

(A) 1672.4 J (B) -1728J (C) 1728J (D) -1572.4J

70. The Specific heat of a gas in an isothermal Process is

(A) zero (B) Negative (C) Infinite (D) Remairs

71. A Containes that suits the occurrence of an isothermal process should be made of

(A) Wood (B) Coppes (C) glass (D) Cloth

72. A thermodynamic Process in which temprature T of the system remains constant through out Variable P and V may Change is called

(A) Isothermal Process (B) Isochoric Process

(C) Isobasic Process (D) None of this

73. When 1g of wates $0^\circ c$ and $10^5 \frac{N}{m^2}$ Pressure is Converted into ice of Volume 1.091 cm^3 the external work done be .... J.

(A) 0.0182 (B) -0.0091 (C) -0.0182 (D) 0.0091

74. The letent heat of Vaporisation of water is $2240 \frac{J}{g}$ If the work done in the Process of expansion of 1g is 168J. then increase in internal energy is .... J

(A) 2072 (B) 2408 (C) 2240 (D) 1904

75. The Volume of an ideal gas is 1 liter column and its Pressure is equal to 72 cm of Hg. The Volume of gas is made 900 cm^3 by compressing it isothermally. The stress of the gas will be .... Hg column.

(A) 4 cm (B) 6 cm (C) 7 cm (D) 8 cm

76. In adiabatic expansion

(A) Δ u=0 (B) Δ u = Positive (C) Ju = Nagative (D) Δ w = 0

77. 1 mm^3 Of a gas is compressed at 1 atmospheric pressure and temperature $27^\circ C$ to $627^\circ C$ What is the final pressure under adiabatic condition. r = 1.5

(A) $80\times10^5 \frac{N}{m^2}$ (B) $36\times10^5 \frac{N}{m^2}$ (C) $56\times10^5 \frac{N}{m^2}$ (D) $27\times10^5 \frac{N}{m^2}$

78. A monoatomic gas for it $\gamma = \frac{5}{3}$ is suddenly Compressed to $\frac{1}{8}$ of its original volume adiabatically then the final Pressure of gas is .... times its intial Pressure.

(A) 8 (B) 32 (C) $\frac{24}{5}$ (D) $\frac{40}{3}$

79. The Pressure and density of a diatomic gas $\gamma = \frac{7}{5}$ Change adiabatically from (P,d) to (P^1,d^1) If $\frac{d'}{d}$=32 then $\frac{p'}{p}$ Should be

(A) 128 (B) $\frac{1}{128}$ (C) 32 (D) None of this

80. An ideal gas at $27^\circ C$ is Compressed adiabatically, to $\frac{8}{27}$ of its original Volume. If $v = \frac{5}{3}$, then the rise in temperaure is

(A) 225 k (B) 450 K (C) 375 K (D) 405 K

81. A diatomic gas intially at $18^\circ C$ is Compressed adiabatically to one eight of its original volume. The temperature after Compression will be

(A) $10^\circ C$ (B) 668 K (C) $887^\circ C$ (D) $144^\circ C$

82. Work done by 0.1 mole of a gas at $27^\circ C$ to double its volume at constant Pressure is ____________ Cal. R = 2 $\frac{Cal}{mol^oK}$

(A) 600 (B) 546 (C) 60 (D) 54

83. A gas expands $0.25m^3$ at Constant Pressure $10^3 \frac{N}{m^2}$ the work done is

(A) 250 J (B) 2.5 erg (C) 250 W (D) 250 N

84. In an isochoric Process $T_1 = 27^\circ C$ and $T_2 = 127^\circ C$ then $\frac{P_1}{P_2}$ will be equal to

(A) $\frac{9}{59}$ (B) $\frac{2}{3}$ (C) $\frac{4}{3}$ (D) $\frac{3}{4}$

85. If the temperature of 1 mole of ideal gas is changed from $0^\circ C$ to $100^\circ C$ at constant pressure, then work done in the process is .... J. R = 8-3 $\frac{J}{molk}$

(A) $8\text{-}3\times10^{-3}$ (B) $8\text{-}3\times10^{2}$ (C) $8\text{-}3\times10^{-2}$ (D) $8\text{-}3\times10^{3}$

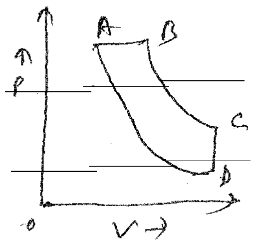
86. A mono atomic gas is supplied the heat Q very slowly keeping the pressure constant The work done by the gas.

(A) $\frac{2}{5}Q$ (B) $\frac{2}{3}Q$ (C) $\frac{3}{5}Q$ (D) $\frac{1}{5}Q$

87. The Volume of air increases by 5% in an adiabatic expansion. The percentange lecrease in its Pressure will br.

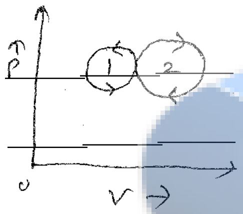
(A) 5% (B) 6% (C) 7% (D) 8%

88. In $P \rightarrow V$ diagram given below, the isochoric, isothermal and isobaric path respectively are



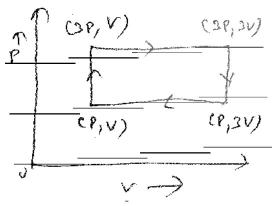
(A) BA,AD,DC (B) DC,CB,BA (C) AB,BC,CD (D) CA,DA,AB

89. In the following indicatos diagram, the net amount of work done will be



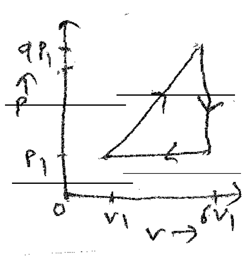
(A) Negative (B) zero (C) Positive (D) Infinity

90. Work done in the given $P \rightarrow V$ diagram in the cyclic process is



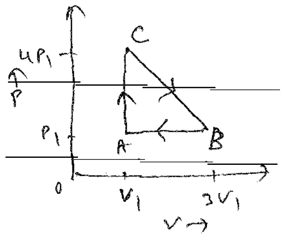
(A) 4 PV (B) 3 PV (C) 2 PV (D) $\frac{PV}{2}$

91. In the Cyclic Process shown is the figure, the work done by the gas in one cycle



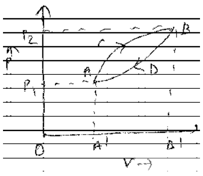
(A) $40P_1V_1$ (B) $20P_1V_1$ (C) $10P_1V_1$ (D) $5P_1V_1$

92. An ideal gas is taken V path ACBA as Shown in figure, The net work done in the whole cycle is



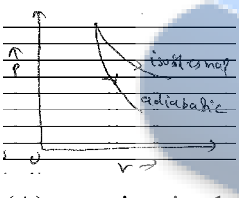
(A) $-3P_1V_1$ (B) Zero (C) $5P_1V_1$ (D) $3P_1V_1$

93. A thermodynamic system is taken from state A to B along ACB and is brought back to A along BDA as Shown in the P$\rightarrow$V diagram. The net work done during the complete cycle is given by the area.



(A) P_1 ACB P_2P_1 (B) ACBDA (C) $ACBB^1A^1A$ (D) $ADBB^1A^1A$

94. Two identical samples of a gas are allowed to expand (i) isothermally (ii) adiabatically work done is



(A) more in anisothermal process (B) more is an adiabatic process

(C) equal in both process. (D) neithes of them

95. What is the relationship Pressure and temperature for an ideal gas under going adiabatic Change.

(A) PT^{γ} = Const (B) $PT^{-1+\gamma}$ = Const (C) $P^{1-\gamma}T^{\gamma}$ = Const (D) $P^{\gamma-1}T^{\gamma}$ = Const

96. For adiabatic Process which relation is true mentioned below ? $\gamma = \frac{C_p}{C_v}$

(A) $p^{\gamma}V$ = Const (B) $T^{\gamma}V$ = Const (C) TV^{γ} =Const (D) $TV^{\gamma-1}$ = Const

97. For adiabatic Process which one is wrong statement?

(A) dQ = 0 (B) entropy is not constant

(C) du = - dw (D) Q = constant

98. Air is filled in a motor tube at $27^{\circ}C$ and at a Pressure of a atmosphere. The tube suddenly bursts. Then what is the temperature of air. given r of air = 1.5

(A) 150 K (B) $150^{\circ}C$ (C) 75 K (D) $27.5^{\circ}C$

99. If v is the radio of Specigic heats and R is the universal gas constant, then the molar Specific heat at constant Volume Cv is given by ....

(A) $\frac{vR}{v-1}$ (B) vR (C) $\frac{R}{v-1}$ (D) $\frac{(v-1)R}{r}$

100. A Car not engine operating between temperature T_1 and T_2 has efficiency 0.4, when T_2 lowered by 50K, its efficiency uncreases to 0.5. Then T_1 and T_2 are respectively.

(A) 300 K and 100 K (B) 400 K and 200 K

(C) 600 K and 400 K (D) 400 K and 300 K

101. A monoatomic gas is used in a car not engine as the working substance, If during the adiabatic expansion part of the cycle the volume of the gas increases from V to $8V_1$ the efficiency of the engine is ..

(A) 60% (B) 50% (C) 75% (D) 25%

102. A System under goes a Cyclic Process in which it absorbs Q_1 heat and gives out Q_2 heat. The efficiency of the Process is n and the work done is W. Which formula is wrong ?

(A) $W = Q_1 - Q_2$ (B) $n = \frac{Q_2}{Q_1}$ (C) $n = \frac{W}{Q_1}$ (D) $n = 1 - \frac{Q_2}{Q_1}$

103. A car not's engine whose sink is at a temperature of 300K has an efficiency of 40% By space should the temperature of the source be increase the efficiency to 60%

(A) 275 K (B) 325 K (C) 300 K (D) 250 K

104. An ideal gas heat engine is operating between $227^{\circ}C$ and $127^{\circ}C$. It absorks 10^4 J Of heat at the higher temperature. The amount of heat Converted into. work is .... J.

(A) 2000 (B) 4000 (C) 5600 (D) 8000

105. Efficiency of a car not engine is 50%, when temperature of outlet is 500K. in order to increase efficiency up to 60% keeping temperature of intake the same what is temperature of out let.

(A) 200 K (B) 400 K (C) 600 K (D) 800 K

106. A car not engine takes 3×10^6 cal of heat from a reservoir at $627^{\circ}C$, and gives to a sink at $27^{\circ}C$. The work done by the engine is

(A) 4.2×10^6 J (B) 16.8×10^6 J (C) 8.4×10^6 J (D) Zero

107. For which combination of working temperatures the efficiency of Car not's engine is highest.

(A) 80 K, 60 K (B) 100 K, 80 K (C) 60 K, 40 K (D) 40 K, 20 K

108. An ideal heat engine working between temperature T_1 and T_2 has an efficiency n. The new efficiency if both the source and sink temperature are doubled, will be

(A) n (B) 2n (C) 3n (D) $\frac{n}{2}$

109. An ideal refrigerator has a freetes at a temperature of $-13^{\circ}C$, The coefficent of perfomance of the engine is 5. The temperature of the air to which heat is rejected will be.

(A) $325^{\circ}C$ (B) $39^{\circ}C$ (C) 325 K (D) $320^{\circ}C$

110. An engine is supposed to operate between two reservoirs at temperature $727^{\circ}C$ and $227^{\circ}C$. The maximum possible efficiency of such an engine is

(A) $\frac{3}{4}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) 1

111. A car not engine Convertsm one sixth of the heat input into work. When the temperature of the sink is reduces by $62^{\circ}C$ the efficiency of the engine is doubled. The temperature of the source and sink are

(A) $80^0C, 37^0C$ (B) $95^0C, 28^0C$ (C) $90^0C, 37^0C$ (D) $99^0C, 37^0C$

112. Car not engine working between 300 K and 600 K has work output of 800J per cycle. What is amount of heat energy supplied to the engine from source per cycle

(A) $1600\frac{J}{cycle}$ (B) $2000\frac{J}{cycle}$ (C) $1000\frac{J}{cycle}$ (D) $1800\frac{J}{cycle}$

113. What is the value of sink temperature when efficiency of engine is 100%

(A) 300 K (B) 273 K (C) 0 K (D) 400 K

114. A car not engine having a efficiency of $n = \frac{1}{10}$ as heat engine is used as a refrigerators. if the work done on the system is 10J. What is the amount of energy absorbed from the reservoir at lowes temperature !

(A) 1 J (B) 90 J (C) 99 J (D) 100 J

115. The temperature of sink of car not engine is $27^{\circ}C$. Efficiency of engine is 25% Then find the temperature of source.

(A) 227^0C (B) 327^0C (C) 27^0C (D) 127^0C

116. The efficiency of car not's engine operating between reservoirs, maintained at temperature $27^{\circ}C$ and $-123^{\circ}C$ is ....

(A) 0.5 (B) 0.4 (C) 0.6 (D) 0.25

117. If a heat engine absorbs 50KJ heat from a heat source and has efficiency of 40%, then the heat released by it in heat sink is ....

(A) 40 KJ (B) 30 KJ (C) 20 J (D) 20 KJ

118. The efficiency of heat engine is 30% If it gives 30KJ heat to the heat sink, than it should have absorbed .... KJ heat from heat source.

(A) 42.8 (B) 39 (C) 29 (D) 9

119. If a heat engine absorbs 2KJ heat from a heat source and release 1.5KJ heat into cold reservoir, then its efficiency is ....

(A) 0.5% (B) 75% (C) 25% (D) 50%

120. If the doors of a refrigerators is kept open, then which of the following is true?

(A) Room is cooled (B) Room is eithers cooled or heated

(C) Room is neither cooled nor heated (D) Room is heated

Assertion-Reason

Instructions :-

Read the assertion and reason carefully to mask the correct option out of the options given below.

(A) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(B) If both assertion and reason are true but reason is not be correct explanation of assertion.

(C) If assertion is true but reason is false.

(D) If the assertion and reason both are false.

121. Assertion : The melting point of ice decreases with increase of Pressure

Reason : Ice contracts on melting.

(A) C (B) B (C) A (D) D

122. Assertion : Fahrenhit is the smallest unit measuring temperature.

Reason : Fahrenhit was the first temperature scale used for measuring temperature.

(A) A (B) C (C) B (D) D

123. Assertion : A beakes is completely, filled with water at $4^{\circ}C$. It will overlow, both when heated or cooled.

Reason : These is expansion of water below $4^{0}C$

(A) A (B) B (C) C (D) D

124. Assertion : The total translation kinetic energy of all the molecules of a given mass of an ideal gas is 1-5 times the product of its Pressure and its volume.

Reason : The molecules of a gas collide with each other and velocities of the molecules change due to the collision

(A) D (B) C (C) A (D) B

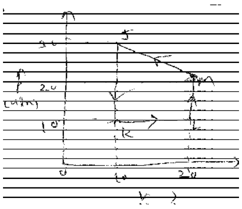
125. Assertion : The car not is useful in understanding the perfomance of heat engine

Reason : The car not cycle provides a way of determining the maximum possible efficiency achivable with reservoirs of given temperatures.

(A) A (B) B (C) C (D) D

Match column

126. Heat given to process is positive, match the following column I with the corresponding option of column I_1



Colum-i	Colum-ii
(A) JK	(p) $\Delta W > 0$
(B) KL	(q) $\Delta Q < 0$
(C) LM	(r) $\Delta W < 0$
(D) MJ	(s) $\Delta Q > 0$

(A) A-p, B-q, C-r, D-s
(B) A-q, B-p, C-s, D-r
(C) A-r, B-s, C-p, D-q
(D) A-s, B-r, C-q, D-p

127. In Column I different Process is given match corresponding option of column I_1

Column - I	Column - II
(A) adiabatic process	(p) $\Delta p = 0$
(B) Isobaric process	(a) $\Delta u = 0$
(C) Isochroic process	(r) $\Delta Q = 0$
(D) Isothermal process	(s) $\Delta W = 0$

(A) A-p, B-s, C-r, D-q
(B) A-s, B-q, C-p, D-r
(C) A-r, B-p, C-s, D-q
(D) A-q, B-r, C-q, D-p

Comprehehsion Type

In a containes of negligible heat capacity, 200g ice at $0^\circ C$ and 100g steam at $100^\circ C$ are added to 200g of water that has temperature $55^\circ C$. Assume no heat is lost to the surroundings and the pressure in the container is constant 1 atm.

128. What is the final temperature the System ?

(A) $72^\circ C$ (B) $48^\circ C$ (C) $100^\circ C$ (D) $94^\circ C$

129. At the final temperature, mass of the toal water present in the system is

(A) 493.6g (B) 483.3g (C) 472.6 g (D) 500 g

130. Amount of the Sm left in the system, is equal to

(A) 16-7 g (B) 8-4 g (C) 12 g (D) 0 g

KEY NOTE

1	B	26	A	51	B	76	C	101	C
2	A	27	C	52	C	77	D	102	B
3	D	28	D	53	A	78	B	103	D
4	D	29	A	54	B	79	A	104	A
5	A	30	D	55	C	80	C	105	B
6	D	31	B	56	D	81	B	106	C
7	C	32	C	57	B	82	C	107	D
8	C	33	D	58	A	83	A	108	A
9	B	34	B	59	C	84	D	109	B
10	A	35	C	60	D	85	B	110	C
11	C	36	A	61	D	86	A	111	D
12	D	37	B	62	C	87	C	112	A
13	A	38	A	63	A	88	D	113	C
14	C	39	C	64	B	89	C	114	B
15	B	40	D	65	C	90	A	115	D
16	D	41	B	66	A	91	B	116	A
17	C	42	A	67	B	92	D	117	B
18	A	43	D	68	D	93	B	118	A
19	B	44	C	69	D	94	A	119	C
20	D	45	C	70	C	95	C	120	D
21	C	46	B	71	B	96	D	121	C
22	D	47	A	72	A	97	B	122	B
23	D	48	D	73	D	98	A	123	A
24	A	49	A	74	A	99	C	124	D
25	B	50	D	75	D	100	D	125	A
								126	B
								127	C
								128	C
								129	B
								130	A

HINT

1. $\frac{\Delta C}{100^0} = \frac{\Delta F}{180^0} \quad \therefore \frac{25}{100} = \frac{\Delta F}{180}$

2. T = 273.15 + $t\,^0C$

   $0 = 273.15 + t\,^0C$

3. equal

4. $4^0\,C$

   $\frac{c}{5} = \frac{F-32}{9}$

5. $\frac{c}{5} = \frac{F-32}{9}$

   $y = mx + c$ with comparision $m = \frac{5}{9}$

6. $\frac{c}{5} = \frac{f-32}{9}$

7. $\frac{F-32}{9} = \frac{K-273}{5}$

8. $\frac{\Delta Tc}{100} = \frac{\Delta TF}{180}$

   $\frac{\Delta Tc}{100} \quad \Delta TC = 40^0\,C$

9. $\frac{\Delta T}{T} = \frac{1}{2} 2\Delta 0 = \frac{1}{2} \times 2 \times 10^{-6} \times 10 = 10^{-5}$

   $\%\ \text{in increase} = \frac{\Delta T}{T} \times 100 = 10^{-5} \times 100 = 1 \times 10^{-3}\ \%$

10. $W = p\Delta V$

11. $C_p = \left(\frac{f}{2} + 1\right) R,\ C_v = \frac{f}{2} R$

   $$\frac{C_p}{C_v} = \frac{\left(\frac{f}{2}+1\right)R}{\frac{f}{2}\ R} = \frac{\frac{f}{2}+1}{\frac{f}{2}} = \frac{f+2}{f} = 1 + \frac{2}{f}$$

12. W = area inside the closed curve

$$= \pi \frac{1}{2}(p_2 - p_1) \times \frac{1}{2}(V_2 - V_1)$$ [Treat Circle as an cllipse]

13. $\Delta u = \frac{P(V_2 - V_1)}{\gamma - 1} = \frac{PV}{\gamma - 1}$

14. $u \propto T \quad \frac{u_1}{u_2} = \frac{T_1}{T_2} \quad \therefore \quad \frac{u_1 - u_2}{u_2} = \frac{T_1 - T_2}{T_2}$

15. For all gases $C_p - C_v = R$

16. $\Delta Q = \Delta u + \Delta w$

17. $\frac{C_p}{C_v} = +\frac{2}{f}$

18. W = area enclose by $P \to V$ graph

$= AB \times BC = (2P - P) \times (2V - V) = PV$

19. W = area under the $P \to V$ curve

Smallest for curve 1, largest for curve 3

20. monoatomic gas $cv = \frac{3}{2}R$, diatomic gas $cv = \frac{5}{2}R$,

one mole of each gas is mixed $C_v(\text{mix}) = \frac{1}{2}\left[\frac{3}{2}R + \frac{5}{2}R\right] = 2R$

$C_p(\text{mix}) = R + C_v$

$= R + 2R = 3R$

$$r = \frac{C_p \text{mix}}{C_v \text{mix}} = \frac{3R}{2R} = 1.5$$

21. dQ = du + dw

22. $C_v \text{ mix} = \frac{n_1 Cv_1 + n_2 Cv_2}{n_1 + n_2}$

23. $\Delta U = \gamma C_v \Delta T$

24. $u = \frac{nfRt}{2}$

n = number of mole of the gas

f = number of degree of freedom

$U_{Total} = U_{02} + U_{AB}$

25. TV = [an adiabatic process]

$T_1V_1 = T_2T_2$

$$\frac{T_1}{T_2} = \left(\frac{V_2}{V_1}\right)$$

26. W = area under the curve and volume axis on the $P \rightarrow V$ diagram.

27. dQ = du + dw

28. energy required in heating water = $ms\Delta\theta$

from coil, $\frac{\text{energy avilable}}{S}$ = Power of coil – Power lost

For 840 J time required = 1S

$\therefore\ 4.2 \times 10^4$ J = ?

$$t = \frac{4.2\times10^5}{840} 500J = 8.33\min = 8\min 205$$

29. $C_p = \frac{(\Delta Q)P}{r\Delta T}$

cv = cp – R

$= 7\text{-}2 = 5\ \frac{\text{cal}}{\text{mol K}}$

30. $\frac{\Delta u}{\Delta Q} = \frac{1}{\wp} = \frac{5}{7}$

$\Delta u = n C_v \Delta T$

$\Delta Q = n C_p \Delta T$

$$\frac{\Delta u}{\Delta Q} = \frac{C_v}{C_p} = \frac{1}{r} = \frac{5}{7}$$

31. For A (ΔQ) P = r C_p (ΔT) A (Isobaric process)

For B (ΔQ) V = C_v (ΔT) B (Isochroic process)

$(\Delta Q)_P = (\Delta Q)_V$

32. Decrease in K.E = increase in I.E $\frac{1}{2}mv^2 = \gamma C_V \Delta T$

33. Rate of heat produced = (Viscous force F) $\times$ (Velocity V)

$$\frac{dQ}{dt} = 6\pi nrv^2 \left[\frac{2}{g}\frac{(\rho-\rho_o)r^2 g}{n}\right]^2$$

34. $\Delta Q = \Delta U + \Delta W$

36. $\Delta Q = \Delta U \quad + \Delta W$

39. $\Delta Q = \Delta U + \Delta W$

$\Delta u = \Delta u - 62.25$ (adiabatic process)

$u = 62.25 \times 10^3$ J

$$C_v = \frac{\Delta u}{n\Delta t}$$

for monoatomic gas $C_v = \frac{3}{2}R = \frac{3}{2} \times 8 - 3 = 12.45 \frac{J}{mol\ K}$

40. If CP_1 and CV_1 is a molar specific heat $CP_1 - CV_1 = R$ ------------ (i)

$Cp = \frac{Cp_1}{32}, Cv = \frac{Cv_1}{32}$ [molar mass of $O_2 = 32$]

From equation (i) $32Cp - 32Cv = R$

$$Cp - Cv = \frac{R}{32}$$

41. (i) $Q = w + \Delta u$

(ii) $Q = W + \Delta u$ (Δu equal)

42. $u = \frac{5}{2} \ell RT$

$PV = \ell RT$ [diatomic gas]

$$u = \frac{5}{2} PV$$

$$V = \frac{mass}{density} = \frac{1}{5} m^3$$

43. $\Delta u = mc\Delta T$

44. given $P \propto T^5$

an adiabatic process $P \propto T^{\frac{\wp}{\wp - 1}}$

45. $\therefore \frac{\wp}{\wp - 1} = 5$

46. W = Patm V

$= \text{Patm} \dfrac{V}{2}$ (i)

Intially Patm V = rRT $\therefore V = \dfrac{\mu RT}{pat}$

49. (i) Volume Constant $\therefore W = P\Delta V = 0$

(ii) Pressure Constant $W = P\int_{V}^{2V} dv = PV$

50. For free expansion Q = W = O

T = const $\mu \therefore \triangleleft E int = o$

51. PV v = Const (an adiabatic process)

PV = m Rt $\therefore V \dfrac{RT}{P}$

52. For both solpe is negative & Slope of adiabatic curve is more

53. W = area of $P \rightarrow V$ diagarm

$= \dfrac{1}{2} P(2V) = PV$

54. AB $\rightarrow$ Constant P, increasing V, increasing T

BC $\rightarrow$ Constant T, increasing V, decreasing P

CD $\rightarrow$ Constant V, decreasing P, decreasing T

DA $\rightarrow$ Constant T, decreasing V, increasing P

Also BC is at highes temperature than AD

57. PV^{γ} = const [adiabatic process]

ideal gas PV = RT (m = 1) $\therefore V = \dfrac{RT}{P}$

$\therefore P\left(\dfrac{RT}{P}\right)^{\gamma} = \text{const} \qquad \dfrac{T^{r}}{P^{(r-1)}} = \text{const}$

58. $Q = W_{AB} + W_{BC} + W_{CA}$

$5 = 10 + 0 + W_{CA}$

59. $W = RT \ \ell oge \dfrac{V_2}{V_1} = 2\text{-}3 \left(\dfrac{M}{Mo}\right) RT \ \ell og_{10} \dfrac{V_2}{V_1}$

60. PV = constant (isothermal Process)

$$P\Delta V - V\Delta P = 0 \quad \therefore \frac{\Delta P}{P} = \frac{-\Delta V}{V}$$

61. PV^{γ} = Constant (an adiabatic Process)

$Pr\ v^{\gamma-1}\ \Delta V + V^{\gamma}\ \Delta P = 0$

62. $$\frac{\left(\frac{\Delta P}{P}\right)_{adiabatic}}{\left(\frac{\Delta P}{P}\right)_{isothermal}} = \frac{-\gamma\ \frac{\Delta V}{V}}{-\ \frac{\Delta V}{V}} = g$$

63. $W = mRT \ln \frac{V_2}{V_1} = R\,T \log_e \frac{V_2}{V_1}$

64. isothermal bulk modulus B = P

64. isothermal bulk modulus $B = P = 1.013 \times 10^5 \frac{N}{m^2}$

66. an adiabatic bulk modulus $B = \nu P$

67. an adiabatic bulk modulus $B = 1.4 \times 1 \times 10^5 = 1.4 \times 10^5 \frac{N}{m^2}$

68. $dQ = \mu Cp\ dT$

69. $W = -\ \mu RT\ \log e$ (isothermally compressed)

70. $C_{iso} = \frac{\Delta Q}{m\Delta T} = \infty$ [$\Delta T = 0$, isothermal process]

71. For isothermal process base is conductory

73. $W = P\,\Delta V$ (isothemal process)

74. $\Delta u = \Delta Q - \Delta w$

74. $P_1V_2 = P_2V_2$ (isothermal process)

76. $\Delta Q = \Delta u + \Delta W$

$0 = \Delta u + \Delta W$

77. $\frac{T^{\gamma}}{P^{\gamma-1}}$ = Constant [adiabatic change]

$$\left(\frac{P2}{P1}\right)^{1/2} = \left(\frac{T_2}{T_1}\right)^{3/2}$$

$$\left(\frac{P2}{10^5}\right)^{1/2} = \left(\frac{900}{300}\right)^{3/2}$$

78. $PV^{\wp}$ = Constant (adiabatic compressed)

$$\frac{P_2}{P_1} = \left(\frac{V_1}{V_2}\right)^8$$

79. PV^{γ} = Constant (adiabatic process

80. $$\frac{T_2}{T_1} = \left(\frac{V_1}{V_2}\right)^{\gamma-1}$$

81. $TV^{\gamma-1}$ = Constant

$$T_2 = T_1\left(\frac{V_1}{V_2}\right)^{\gamma-1}$$

82. $\frac{V_1}{V_2} = \frac{T_1}{T_2}$ $\quad \therefore \frac{V}{2V} = \frac{300}{T_2}$ $\quad \therefore T_2 = 600K$

$W = P\Delta V$

83. $W = P\Delta V = 10^3 \times 0.25 = 250\ J$

84. $P \propto T$ (constant volume)

$$\frac{P_1}{P_2} = \frac{T_1}{T_2}$$

85. $W = P\Delta V$

86. $\Delta W = (\Delta Q)_P - \Delta u$

$= (\Delta Q)_P - (\Delta Q)_V$

$$= (\Delta Q)_P - \left[1 - \frac{(\Delta Q)V}{(\Delta Q)P}\right]$$

$$= (\Delta Q)_P\left[1 - \frac{CV}{CP}\right]$$

87. $\frac{dp}{p} \times 100 = -\gamma \frac{dv}{V} \times 100$ (adiabatic expansion)

89. cyclic process 1 nagative work
2 net positive

90. $W \rightarrow$ area of closed $P \rightarrow V$ diagram
$= (3V-V)(3P-P) = 4PV$

91. W = area under curve

92. W = area under curve

94. $\therefore$ $(Area)_{iso}$ >$(Area)_{adi}$ Wiso > w_{ad}:

95. PV^{γ} = Con

96. PV^{γ} = Con

97. ΔQ = O, Q = const, du = - dw (aidabatic process)

98. $$\frac{T_2}{T_1} = \left(\frac{P_2}{P_1}\right)^{\frac{\gamma-1}{\gamma}}$$

99. $$\frac{CP}{CV} = \gamma \qquad \therefore \ CP = \gamma \ CV$$

but CP - CV = R

100. $n = 1 - \frac{T_2}{T_1}$ 100.

101. $T_1V_1^{\gamma-1} = T_2V_2^{\gamma-1}$ (qdiabafic process)

$$T_1 = T_2 \left(\frac{V_2}{V_1}\right)^{\gamma-1}$$

103. $n = 1 - \frac{T_2}{T_1}$

104. $n = 1 - \frac{T_2}{T_1} = \frac{1\text{-}400}{500} = \frac{1}{5}$

$W = n \ Q_1$

105. $n = 1 - \frac{T_2}{T_1}$, $\frac{T_2}{T_1}$ Should be minimum

106. (i) $n = 1 - \frac{T_2}{T_1}$

(ii) $n^1 = 1 - \frac{2T_2}{2T_1} = 1 - \frac{T_2}{T_1} = n$

109. $$\alpha = \frac{T_2}{T_1 - T_2}$$

110. $n = 1 - \frac{T_2}{T_1} = 1 - \frac{500}{1000} = \frac{1}{2}$

111. (i) $n = 1 - \frac{T_2}{T_1} = \frac{W}{Q_1} = \frac{1}{6} \quad \therefore \quad n = \frac{1}{6}$ - (1)

(ii) $n^1 = 1 - \frac{T_2 - 62}{T_1}$

$= 1 - \frac{T_2}{T_1} + \frac{62}{T_1}$

$= n + \frac{62}{T_1} - (2)$

Now, $n^1 = 2n$

112. $n = 1 - \frac{T_2}{T_1} = \frac{W}{Q_1} \quad \therefore Q = \left(\frac{T_1}{T_1 - T_2}\right) w$

113. $n = 1 - \frac{T_2}{T_1}$

114. $n = 1 - \frac{T_2}{T_1}$

$W = Q_2\left(\frac{T_1}{T_2} - 1\right)$

115. $n = 1 - \frac{T_2}{T_1}$

116. $n = 1 - \frac{T_2}{T_1}$

117. $n = 1 - \frac{Q_2}{Q_1}$

118. $n = 1 - \frac{Q_2}{Q_1}$

119. $n = 1 - \frac{Q_2}{Q_1}$

121. with rise in pressure melting point of ice decreases. Also ice contracts on melting.

122. celcius scale was the first temperature scale and Fahrenhit is the smallest unit measuring.

123. Water has maximum density at $4^\circ C$ on heating above $4^\circ C$ or cooling below $4^\circ C$ density of water decreases and its volume increases, therefore, water overflows in the both cases.

124. $\frac{1}{2} m (\upsilon^2) = \frac{3}{2} RT$

125. car not cycle has maximum efficiency

126. (a) isochoric process $\Delta w = 0$ $\therefore \Delta Q = \Delta u$

$P \propto T$ P decrease, T also decrease $\therefore \Delta u$ negative $\therefore \Delta Q < 0$

(b) isobasic process, volume increase $\therefore \Delta W > 0$

(c) isochoric process $\Delta W = 0$ $\Delta Q = \Delta u$

$P \propto T$, P increase $\therefore$ T increase $\therefore \Delta Q > 0$

(d) Volumedecrease $\Delta W < 0$

127. adiabatic process $\Delta Q = 0$

Isobasic process $P = const$ $\therefore \Delta P = 0$

Isochroic process $V = const$ $\therefore \Delta W = 0$

Isothermal process $T = const$ $\therefore \Delta u = 0$

128 to 130.

head rewuired by ice and water to go up

to $100^0 C$ $= m_1 L + m_1 sw\ \Delta T + mw\ sw\ \Delta T$

$= 200 \times 80 + 200 \times 1 \times 100 + 200 \times 1 \times 45$

$= 16,000+20,000+9,000$

$= 45,000$ cal

= give by m_s mass of steam

= ms L

$ms = \frac{45,000}{540} = 83.3$ g convert into waters of $100^0 C$

Total water $= 200 + 200 + 83.3$

$= 483.3$ g

steam left $= 100 - 83.3 = 16.79$