1. **Avagadro's Law**: - It states that equal volume of all the gases under similar conditions of temperature and pressure contains equal number of molecules.
2. **Temperature:** - It is the property which tells an equilibrium state. When 2 bodies are in thermal equilibrium with contain equal number of molecules.
3. **Heat:** -Heat is a form of energy that flows from one body to another due to the differences in their temperatures.

4. **Calorie (or Kilo calorie):** - It is defined as the heat required to raise the temperature of 1kg of water by 1^0C, from 14.5 ^{0}C to 15.5^{0}C.

5. **Specific heat**: - The specific heat is defined as amount of heat required to raised the temperature of 1Kg of the substance through 1 Kelvin. It is denoted by C. Its unit is $Jkg^{-1}K^{-1.}$

$$c = \frac{\Delta Q}{m\Delta T}$$

6. **Molar specific heat©:** - The amount of heat required to raise the temperature of 1 mole of a body through 1K is called molar specific heat.
   And C=Mc Where M is the molecular weight of the body.

7. **Thermal capacity or heat capacity:** - The amount of heat required to raise the temperature of a given mass of a body through 1K (or 1^0C) is called thermal capacity of the body.

8. **Latent heat (L):** - It is defined as the quantity of heat required to change the unit mass of a substance completely from one state into another at constant temperature.

9. **Latent heat of fusion:** - It is the amount of heat required to change the unit mass of a solid into its liquid state at its melting point at constant temperature.
   e.g Latent heat of fusion of ice = 80kcal kg^{-1}

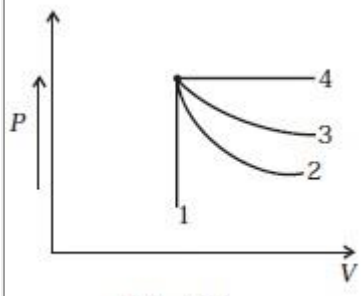
10. **Latent heat of vaporization:** - It is the amount of heat required to change the unit mass of a liquid to its vapour state at its boiling point at constant temperature.
    e.g. Latent heat of vaporization of water = 540 kcal kg^{-1}

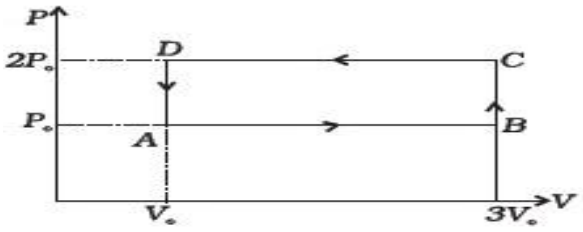
11. **First law of thermodynamics**: - If the heat is supplied to a system which is capable of doing work then the quantity of heat observed by the system will be equal to the sum of external work done by the system and the increase in its internal energy.

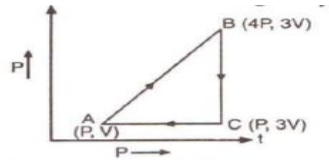
12. **Adiabatic process:** - A process in which no heat enters or leaves a system is called an adiabatic process. For an adiabatic process Q=0.
13. **Isochoric Process:** - When a substance undergoes a process in which the volume remains unchanged (ΔV =), the process is called isochoric.

14. **Isothermal Process:** - A process which takes place at constant temperature is said to be isothermal. In general, none of the quantities Q, W or ($V_2 - V_1$) is 0.

15. **Isobaric process:** - A process which takes place at constant pressure is called an isobaric process.

S.No.	Question Details		Marks
	MCQ		
1.	In the relation dQ = dU +dW, the quantity which remains same for all processes is:		**1**
	(a) dQ	(b) dU	
	(c) dW	(d) all the above	
2.	Consider two containers A and B containing identical gases at the same pressure, volume and temperature. The gas in container A is compressed to half of its original volume isothermally while the gas in container B is compressed to half of its original value adiabatically. The ratio of final pressure of gas in B to that of gas in A is:		**1**
	(a) $2^{\gamma-1}$	(b) $(1/2)^{\gamma-1}$	
	(c) $(1/1-^{\gamma})^2$	(d) $(1/^{\gamma}-^{1})^2$	
3.	An ideal gas undergoes four different processes from the same initial state. Four processes are adiabatic, isothermal, isobaric and isochoric. Out of 1, 2, 3 and 4 which one is adiabatic.  Fig. 12.1		**1**
	(a) 4	(b) 3	
	(c) 2	(d) 1	
4.	If an average person jogs, he produces 14.5×10^3 cal/min. This is removed by the evaporation of sweat. The amount of sweat evaporated per minute (assuming 1 kg requires 580×10^3 cal for evaporation) is:		**1**
	(a) 0.25 kg	(b) 2.25 kg	
	(c) 0.05 kg	(d) 0.20 kg	

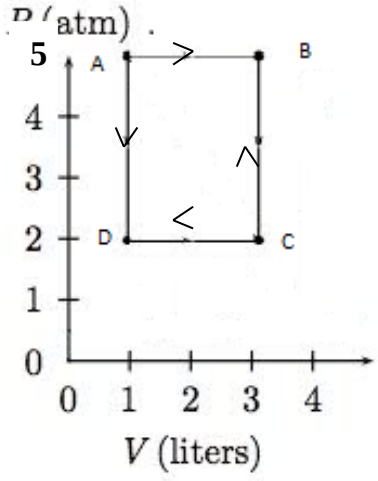
5.	An ideal gas undergoes cyclic process ABCDA as shown in given P-V diagram (Fig. 12.4). The amount of work done by the gas is  Fig 12.4		**1**
	(a) $6P_o V_o$	(b) $-2 P_0 V_{o+}$	
	(c) $+ 2 P_o V_o$	(d) $+ 4 P_o V_o$	
6.	Three copper blocks of masses M_1, M_2 and M_3 kg respectively are brought into thermal contact till they reach equilibrium. Before contact, they were at T_1, T_2, T_3 ($T_1 > T_2 > T_3$). Assuming there is no heat loss to the surroundings, the equilibrium temperature T is: (s is specific heat of copper)		**1**
	(a) $T= (T_1+T_2+T_3)/3$	(b) $T= (M_1T_1+M_2T_2+M_3T_3)/(M_1+M_2+M_3)$	
	(c) $T= (M_1T_1+M_2T_2+M_3T_3)/3(M_1+M_2+M_3)$	(d) $T= (M_1T_1s+M_2T_2s+M_3T_3s)/(M_1+M_2+M_3)$	
7.	During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio Cp/Cv for the gas is:		**1**
	(a) 3/2	(b) 2/3	
	(c) 4/3	(d) 5/3	
8.	An engine has an efficiency 1/6.When the temperature of the sink is reduced by 62^0C its efficiency is doubled. The temperature of the source is:		**1**
	(a) 124^0C	(b) 37^0C	
	(c) 62^0C	(d) 99^0C	
9.	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:		**1**
	(a) 90J	(b) 99J	
	(c) 100J	(d) 1J	

10.	A sample of ideal monoatomic gas is taken around the cycle ABCA as shown in the figure. The work done during the cycle is:  		**1**
	(a) 3PV	(b) zero	
	(c) 9PV	(d) 6PV	
11.	Incorrect statements regarding the first law of thermodynamics is :		**1**
	(a**)** It introduces the concept of the internal energy	(b) It introduces the concept of entropy	
	(c) It is not applicable to any cyclic process	(d) It is a restatement of the principle of conservation of energy	
12	In an isothermal process, the statement which is not true is:		**1**
	(a) temperature remains constant	b) internal energy does not change	
	c)no heat enters or leaves the system	d)None of the above	
13.	A monoatomic gas is suddenly compressed to $1/8^{th}$ of its initial volume adiabatically. The ratio of final pressure to the initial pressure is:		**1**
	(a) 32	(b) 40/3	
	(c) 24/5	(d) 8	
14	The concept of temperature to measure the hotness and coldness of a body is a consequence of:		
	(a)Joule's law	(b) First law of thermodynamics	

	(c) Newton 's law of cooling	(d)zeroth law of thermodynamics	
15	Among the following parameters which does not characterize the thermodynamic states of Matter is:		**1**
	(a)Work	(b) Volume	
	(c) Temperature	(d) Pressure	
16	Assertion: The heat supplied to a system is always equal to the increase in its internal energy. Reason: When a system changes from one thermal equilibrium to another, some heat is absorbed by it.		**1**
	(a) If both assertion and reason are true and the reason is the correct explanation of the assertion. (c) If assertion is true but reason is false.	(b) If both assertion and reason are true but reason is not the correct explanation of the assertion. (d) If the assertion and reason both are false	
17	Assertion : The specific heat of a gas is an adiabatic process is zero and in an isothermal process is infinite. Reason : Specific heat of a gas in directly proportional to change of heat in system and inversely proportional to change in temperature.		**1**
	(a) If both assertion and reason are true and the reason is the correct explanation of the assertion. (c) If assertion is true but reason is false.	(b) If both assertion and reason are true but reason is not the correct explanation of the assertion. (d) If the assertion and reason both are false	
18	Assertion : Air quickly leaking out of a balloon becomes coolers Reason : The leaking air undergoes adiabatic expansion.		**1**
	(a) If both assertion and reason are true and the reason is the correct explanation of the assertion. (c) If assertion is true but reason is false.	(b) If both assertion and reason are true but reason is not the correct explanation of the assertion. (d) If the assertion and reason both are false	
19	Assertion : When a bottle of cold carbonated drink is opened, a slight fog forms around the opening. Reason : Adiabatic expansion of the gas causes lowering of temperature and condensation of water vapours.		**1**
	(a) If both assertion and reason are true and the reason is the correct explanation of the assertion. (c) If assertion is true but reason is false.	(b) If both assertion and reason are true but reason is not the correct explanation of the assertion. (d) If the assertion and reason both are false	

20	Assertion: Work and heat are two equivalent form of energy. Reason: Work is the transfer of mechanical energy irrespective of temperature difference, whereas heat is the transfer of thermal energy because of temperature difference only.		**1**
	(a) If both assertion and reason are true and the reason is the correct explanation of the assertion. (c) If assertion is true but reason is false.	(b) If both assertion and reason are true but reason is not the correct explanation of the assertion. (d) If the assertion and reason both are false	
21.	How is the efficiency of a Carnot engine affected by the nature of the working substance?		**1**
22.	What is a heat pump? Give an example?		**1**
23.	Why water at the base of a waterfall is slightly warmer than at the top?		**1**
24.	Can two isothermal curves intersect? Give reason?		**1**
25.	When ice melts change in internal energy is greater than the heat supplied. Why?		**1**
26.	Is it possible to increase the temperature of a gas without adding heat to it? Explain		**1**
27.	If a refrigerator's door is kept open, will the room become cool or hot? Explain.		**1**

28	By applying the first law of thermodynamics to isobaric process, obtain relation between two specific heats of a gas.	**2**
29	The volume of an ideal gas is at V at a pressure P. On increasing the pressure by ΔP, the change in volume of the gas is (ΔV_1) under isothermal conditions and (ΔV_2) under adiabatic conditions. Is $\Delta V_1 > \Delta V_2$ or vice versa and why?	**2**
30	Refrigerator A works between 10^0C and 27 ^{0} C, while refrigerator B works between -27^0 C and 17 ^{0} C, both removing heat equal to 2000 J from the freezer. Which of the two is better refrigerator?	**2**
31	In an effort to cool a kitchen during summer, the refrigerator door is left open and the kitchen door and windows are closed. Will it make the room cooler?	**2**
32	If a drop of water falls on a very hot iron, it takes long time to evaporate. Explain why.	**2**
33	A Carnot's reversible heat engine works between 600K and 300K. In each cycle of operation s , the engine draws 1000 J of energy from the source at 600K. Calculate (i) the energy rejected to the sink at 300K. (ii) The external work done by the engine. (iii) The efficiency of the engine. [500 J 500J , 50%]	**3**
34	Calculate the increase in internal energy of 1kg of water at 100 C when it is converted into steam at the same temperature and at 1 atm. The density of water and steam are 1000kg/m^3 and 0.6kg/m^3 respectively. The latent heat of vaporization of water is 2.25 x 106J/kg. (Ans.2.08 x 106J	**3**

35	One mole of an ideal gas undergoes a cyclic change ABCD. Calculate the following from Fig (i) Work done along AB ,BC , CD and DA . (ii) net work done in the process (iii) efficiency of the process , (iv) Net change in the internal energy of the gas (given 1 atmosphere = 1.01x 105N/m2)  [(i) 1010J , 0.-404 J,0 (ii) 606 J (iii) 60% (iv) zero]	**3**
36	A Carnot refrigerator works between temperature limits of 0°C and 27 °C. If 10 kg of water at 0°C is converted into ice at 0°C calculate (i) the heat rejected (ii) the energy supplied to the refrigerator. Given latent heat of ice = 336 KJ/kg	**3**
37	A gas absorbs 100 calorie of heat and performs 350J of work. Calculate change in internal energy of the gas in the process. (70J)	**3**
38	0.014 kg of nitrogen is enclosed in a vessel at a temperature of 27C. How much heat has to be transferred to the gas to double the rms speed of its molecules? (R = 2cal. /mole/K) (2250cal)	**3**
39	Prove that Cp - Cv = R , for an ideal gas .	**3**
40	Show that an adiabatic curve is always steeper than an isothermal curve. Explain the reason.	**3**
41	Discuss one application of first law of thermodynamics. What are its limitations?	
42	What is refrigerator? Describe the construction and obtain the expression for its coefficient of performance.	**5**
43	What is isothermal process? State two essential conditions for such a process to takes place. Show analytically that the work by one mole of an ideal gas during volume expansion from V_1 to V_2 at temperature T is given by : $W = RT \log_e V_2/V_1$	**5**

44	Define an adiabatic process. State two essential conditions for such a process to takes place. Derive an expression for adiabatic process to takes place.	**5**
45	What do you mean by Carnot cycle? Explain. Derive an expression for efficiency of a Carnot engine.	**5**
46	Case Study – 1 Read the following paragraph and answer the questions Zeroth Law of Thermodynamics states that two systems in thermal equilibrium with a third system separately are in thermal equilibrium with each other. The Zeroth Law clearly suggests that when two systems A and B, are in thermal equilibrium, there must be a physical quantity that has the same value for both. This thermodynamic variable whose value is equal for two systems in thermal equilibrium is called temperature (T). Thus, if A and B are separately in equilibrium with C, TA = TC and TB = TC. This implies that TA = TB i.e. the systems A and B are also in thermal equilibrium. Zeroth Law of Thermodynamics leads to the concept of internal energy of a system. We know that every bulk system consists of a large number of molecules. Internal energy is simply the sum of the kinetic energies and potential energies of these molecules. A certain amount of heat is supplied to the system' or 'a certain amount of work was done by the system its energy changes. (i) Three thermodynamic systems are at temperature of 50^0 C. What can we say about them? a) Heat flows between them b) It obeys Zeroth Law of Thermodynamics c) Temperature of one system will increase and temperature of remaining two will decrease d) None of these (ii)Zeroth law of thermodynamics helped in the creation of which scale? Also state one application of Zeroth Law in real life. (iii)State Zeroth Law of Thermodynamics OR (iii) Define Internal energy of system	
47	Case Study -2 Read the following paragraph and answer the questions. A system in thermodynamics refers to that part of universe in which observations are made and remaining universe constitutes the surroundings. The surroundings include everything other than the system. System and the surroundings together constitute the universe. The universe = The system + The surroundings However, the entire universe other than the system is not affected by the changes taking place in the system. Therefore, for all practical purposes, the surroundings are that portion of the remaining universe which can interact with the system. Usually, the region of space in the neighborhood of the system constitutes its surroundings. The wall that separates the system from the surroundings is called boundary. Types of the System We, further classify the systems according to the movements of matter and energy in or out of the system. 1) Open System In an open system, there is exchange of energy and matter between system and surroundings. The presence of reactants in an open beaker is an example of an open system. Here the boundary is an imaginary surface enclosing the beaker and reactants.	

	2) Closed System In a closed system, there is no exchange of matter, but exchange of energy is possible between system and the surroundings. The presence of reactants in a closed vessel made of conducting material e.g., copper or steel is an example of a closed system. 3) Isolated System In an isolated system, there is no exchange of energy or matter between the system and the surroundings. The presence of reactants in a thermos flask or any other closed insulated vessel is an example of an isolated system. The State of the System The system must be described in order to make any useful calculations by specifying quantitatively each of the properties such as its pressure (p), volume (V), and temperature (T) as well as the composition of the system. (i)Which of the following is a type if system? a) Open system b) closed system c) Isolated system d) All the above (ii) What are the types of system? (iii)State and explain the first law of thermodynamics. OR (iii)Explain the terms a) system b) surrounding c) boundary	