HEAT AND THERMODYNAMICS

1) When the volume of a given mass of gas at 27^{o} C is twice at constant pressure then Temperature of the gas changes to

   a) 300^{o} C b) 54^{o} C c) 327^{o} C d) 600^{o} C

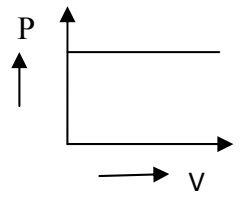
2) If 'x^{o}' be the same temperature in both the Centigrade (Celsius) and Fahrenheit scale then its value is

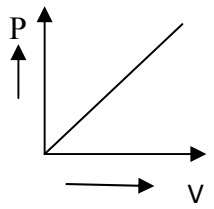
   a) 0^{o} b) -273^{o} c) -40^{o} d) 273^{o}

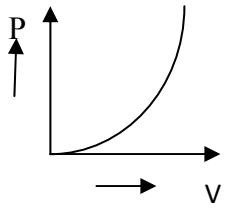
3) In which of the process does internal energy of the system remains constant?

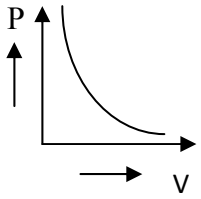
   a) Isothermal b) Isobaric c) Isochoric d) Adiabatic

4) Which graph best represents the relation ship between pressure and volume for a given mass of an ideal gas at constant temperature?

   a) 

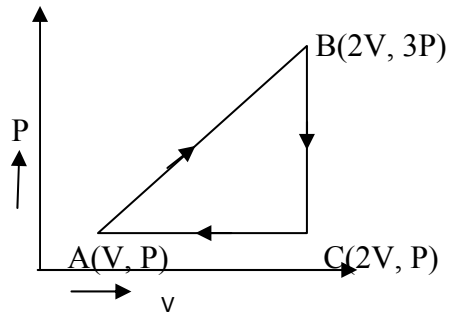
   b) 

   c) 

   d) 

5) An ideal mono atomic gas is taken through a cyclic process ABCA as shown in PV diagram, work done per cycle is

   a) 2 PV
   b) 6 PV
   c) 9 PV
   d) PV



6) A mono atomic gas is suddenly compressed to $(1/8)^{th}$ of its initial volume adiabatically, the ratio of its final pressure to initial pressure is (given the ratio of sp-heats of the given gas tobe5/3)

   a) 24/5 b) 8 c) 32 d) 40/3

7) An ideal mono atomic gas at 27^oC is compressed adiabatically to 8/27 times of its present volume. The increase in temperature of the gas is

a) 375^o C b) 402^o C c) 175^o C d) 475^oC

8) The relation between temperature and volume in an adiabatic change is

a) $TV^{\gamma-1}$ =constant b) $VT^{\gamma-1}$=constant c) TV = constants d)T/V = constants

9) $1m^3$ of air at a temperature 290K is raised to 580K keeping pressure constant the new volume is

a) 1.65 m^3 b) 2 m^3 c) 0.5 m^3 d) 1 m^3

10) Airplanes are painted white because

a) It is cheaper.
b) They can be easily seen at a far distance.
c) White surfaces are poor absorbers of heat.
d) White surfaces are good absorbers of heat.

11) Absolute zero temperature is

a) 273.15^oC b) 0^oC c) The temperature of liquid helium d)-273.15^oC

12) A vessel contains one mole of oxygen at a temperature T and pressure P. Another identical vessel congaing one mole of helium gas at a temperature 2T has a pressure of

a) P b) P/8 c) 2P d)8P

13) When same amount of heat is supplied to equal volumes of two different substances the temperature of

a) Both the substances remains the same.
b) The substances are different.
c) The substances may either remains same or different.
d) One increases and another decreases.

14) Heat supplied to a gas at constant volume is utilized to

a) Do external work against pressure.
b) Increase internal energy.
c) Either (a) or (b).
d) Both (a) and (b).

15) Amount of heat absorbed during the change of state without rise in temperature is known as

a) Specific heat.
b) Latent heat.
c) Thermal capacity.
d) Thermal conductivity.

16) If M is the molecular weight of a gas then the specific heat capacity at constant pressure P is

a) $R/\gamma-1$ b) $\gamma R/\gamma-1$ c) $\gamma R/M(\gamma-1)$ d) $\gamma RM/(\gamma-1)$

17) The factor not needed to calculate heat lost or heat gained (provided there is no change of state) is

a) Mass b) Specific heat c) Temperature change d) Relative density

18) Certain quantity of water at 100 ^{0}C is mixed with thrice the quantity of water at 70 ^{o}C the final temperature of the mixture after stirring is

a) 80 ^{o}C b) 66.7 ^{o}C c) 85 ^{o}C d) 77.5 ^{o}C

19) One mole of ideal gas requires 207 J of heat to raise the temperature by 10 K when heated at constant volume. If the same gas is heated at constant pressure, the quantity of heat required to raise the temperature by 10 K is ($R=8.30$ J mol $^{-1}$ K $^{-1}$)

a) 198.7 J b) 29 J c) 215.3 J d) 124 J

20) The temperature at which a block of wood and a block of metal both appear equally hot cold is

a) 0 ^{o}C b) 100 ^{o}C c) 37 ^{o}C d) 20 ^{o}C

21) One mole of mono atomic gas ($\gamma=5/3=1.66$) is mixed with one mole of diatomic gas($\gamma=7/5=1.40$) . The value of γ for the mixture is

a) 1.4 b)1.5 c) 1.45 d)1.54

22) The energy shared per molecule in a diatomic gas is

a) 1/2 KT b) 3/2 KT c) 5/2 KT d) 3KT

23) A mono atomic gas initially at temperature T_1 is enclosed in a cylinder fitted with a frictionless piston. The gas is allowed to expand adiabatically to temperature T_2 by releasing the piston suddenly. If L_1 and L_2 are lengths of the gas column before and after expansion than T_l/T_2 is given by

a) $(L_1/L_2)^{2/3}$ b) L_2/L_1 c) $(L_1/L_2)^{5/3}$ d) $(L_2/L_1)^{2/3}$

24) The number of degrees of freedom for a diatomic molecule are

a) 2 b) 5 c) 3 d) 9

25)) Convection takes place

a) Only in gasses.
b) Only in liquids.
c) Both in liquids and solids.
d) Both in liquids and gasses.

26) If the temperature difference between the opposite faces of a metal block is doubled, then its thermal conductivity

a) Increases.
b) Decreases.
c) Remains unchanged.
d) May increase or decreases depending on the material.

27) Two rods A & B of equal lengths have the thermal conductivities K_A &K_B. Each rod has its ends at temperatures T_1 & T_2 respectively. If A_A & A_B are the area of cross section of the rods A & B and same rate of flow of heat is maintained in both of them, then

a) $K_A K_B = A_A A_B$ b) $A_A / A_B = K_A / K_B$ c) $K_A / K_B = A_B / A_A$ d) $K_A / K = \sqrt{A_A / A_B}$

28) Devise used to measure very high temperature is

a) Calorimeter b) Bolometer c) Thermometer d) Pyrometer

29) The kinetic energy of helium molecule (mono atomic) at $27^{o}C$ is
(Boltzmann constant K = 1.38×10^{-23} J/K)

a) 10.4×10^{-20} J b) 10.4×10^{-21} J c) 6.2×10^{-21} J d) 6.2×10^{-20} J

30) The dimensions of thermal conductivity are

a) $[L\ M\ T^{-3}\ \theta^{-1}]$ b) $[L^{-1}\ M\ T^{-3}\ \theta^{-1}]$ c) $[L\ M\ T^{-3}\ \theta]$ d) $[L\ M\ T^{-1}\ \theta]$

31) The S.I unit of thermal conductivity K is

a) K cal $M^{-1}\ K^{-1}\ S^{-1}$ b) cal $M^{-1}\ K^{-1}\ S^{-1}$ c) J $M^{-1}\ K^{-1}\ S^{-1}$ d) JK^{-1}

32) During adiabatic compression of gas its temperature

a) Remains constant b) Rises c) Falls d) Becomes zero

33) Mode of transmission of heat from one place to another, without the help of intervening medium is

a) Conduction b) Convection c) Radiation d) Wave motion

34) Which one of the fallowing statements is not true regarding thermal radiation

a) They travel in straight lines with a velocity of 3×10^{8} ms^{-1} in free space.
b) They are electromagnetic in nature.
c) All bodies emit thermal radiation at all temperature.
d) They cannot be reflected by mirrors.

35) A perfectly black body is one which

a) Absorbs all the energy that fall on it.
b) Does not absorb any energy (or heat radiation of any wave length) that falls on it.
c) Absorbs a part of the energy that falls on it.
d) Absorbs a few components of energy falling on it.

36) According to Stefan's law the energy emitted per unit area per unit time of a black body is directly proportional to

a) T b) T^2 c) T^3 d) T^4

37) The S.I unit of Stefan's constant is

a) $N M^{-2} K^{-4}$ b) $J M^{-2} K^{-4}$ c) $J M^2 S^{-1} K^{-4}$ ($W M^2 K^{-4}$) d) $W M^{-2} K^{-1}$

38) A Carnot engine takes heat from a reservoir at 627^oC and rejects heat to a sink at 27^oC. What is its efficiency

a) 200/209 b) 3/5 c) 1/3 d) 2/3

39) First law of thermodynamics based on the law of conservation of

a) Mass b) Energy c) Charge d) momentum

40) The velocity of thermal radiation in vacuum is

a) Equal to the velocity of light.
b) Less than the velocity of light.
c) Greater than the velocity of light.
d) Equal to the velocity of sound.

41) According to Wien's law

a) $\lambda_m T$ =constant b) λ_m / T =constant c) $)T/ \lambda_m$ =constant d) $\lambda^2_m T$ =constant

42) A Carnot's engine operates between 400K and 800K. its efficiency is

a) 25% b) 50% c) 75% d) 100%

43) The emissive power of a perfect black body is

a) Zero b) Unity c) Infinity d) 0.5

44) The process in which pressure P remains constants ie P=constant or $\Delta P = 0$ called

a) Isothermal b) Adiabatic c) Isochoric d) Isobaric

45) Which of the following relations between C_P and C_V is correct

a) $C_P - C_V = R^{-1}$ b) $C_P + C_V = R$ c) $C_P / C_V = V$ d) $C_P - C_V = R$

46) In an adiabatic change between the system and surroundings

a) There is no transfer of heat, hence the temperature remains constant.
b) There is no transfer of heat in such a way that the temperature remains constant.
c) There is no transfer of heat, but the temperature may vary.
d) There is free transfer of heat as well as variation in the temperature.

47) In the gas equation PV^{γ} =constant (with γ=1) then the process is

a) Isothermal b) Adiabatic c) Isobaric d) Isobaric

48) Conduction of heat in gasses is

a) Rapid b) Significance c) Poor d) Uncertain

49) The internal energy of a real gas depends on

a) Temperature only.
b) Pressure only.
c) Volume only.
d) Both temperature and volume.

50) An ideal mono-atomic gas is taken round the cycle ABCDA as shown in figure. The work done during the cycle is

a) PV
b) 2PV
c) PV / 2
d) Zero