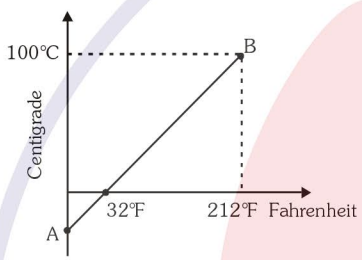
TEMPERATURE & THERMAL EXPANSION

1. At what temperature does the temperature in Celsius and Fahrenheit equalise
(1) –40° (2) 40°
(3) 36.6° (4) 38°

2. A difference of temperature of 25° C is equivalent to a difference of :
(1) 45° F (2) 72° F
(3) 32° F (4) 25° F

3. The graph AB shown in figure is a plot of temperature of a body in degree Celsius and degree Fahrenheit. Then



(1) slope of line AB is 9/5
(2) slope of line AB is 5/9
(3) slope of line AB is 1/9
(4) slope of line AB is 3/9

4. If two rods of length L and 2L having coefficients of linear expansion α and 2α respectively are connected so that total length becomes 3L, the average coefficient of linear expansion of the composition rod equals:

(1) $\frac{3}{2}\alpha$ (2) $\frac{5}{2}\alpha$

(3) $\frac{5}{3}\alpha$ (4) none of these

5. The table gives the initial length ℓ_0, change in temperature ΔT and change in length $\Delta\ell$ of four rods. Which rod has greatest coefficient of linear expansion

Rod	ℓ_0(m)	ΔT(°C)	$\Delta\ell$(m)
A1	1	100	1
A2	1	100	2
A3	1.5	50	3
A4	2.5	20	4

(1) A_1 (2) A_2 (3) A_3 (4) A_4

CALORIMETRY

6. A body of mass 5 kg falls from a height of 30 metre. If its all mechanical energy is changed into heat, then heat produced will be:-
(1) 350 cal (2) 150 cal
(3) 60 cal (4) 6 cal

7. The amount of heat required in converting 1 gm ice at -10^0 C into steam at 100^0 C will be :–
(1) 3028 J (2) 6056 J
(3) 721 J (4) 616 J

8. A block of mass 2.5 kg is heated to temperature of 500°C and placed on a large ice block. What is the maximum amount of ice that can melt (approx.). Specific heat for the body = 0.1 cal/g°C.
(1) 1 kg (2) 1.5 kg (3) 2 kg (4) 2.5 kg

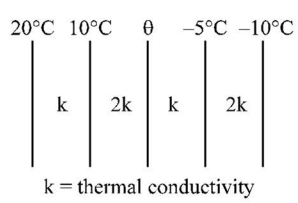
9. 1 kg of ice at – 10°C is mixed with 4.4 kg of water at 30°C. The final temperature of mixture is :
(specific heat of ice = 2100 J/kg-k)
(1) 2.3°C (2) 4.4°C (3) 5.3°C (4) 8.7°C

CONDUCTION AND CONVECTION & RADIATION

10. A composite rod made of three rods of equal length and cross-section as shown in the fig. The thermal conductivities of the materials of the rods are K/2, 5K and K respectively. The end A and end B are at constant temperatures. All heat entering the face A goes out of the end B and there being no loss of heat from the sides of the bar. The effective thermal conductivity of the bar is

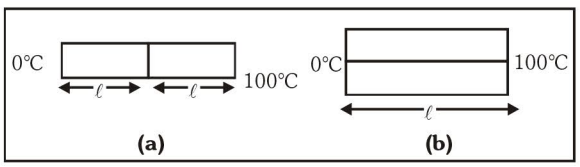
(1) 15K/16 (2) 6K/13
(3) 5K/16 (4) 2K/13.

11. The figure shows the face and interface temperature of a composite slab containing of four layers of two materials having identical thickness. Under steady state condition, find the value of temperature θ.



(1) 5°C (2) 10°C
(3) –15°C (4) 15°C

12. Two identical square rods of metal are welded end to end as shown in figure (1), 20 calories of heat flows through it in 4 minutes. If the rods are welded as shown in figure (2), the same amount of heat will flow through the rods in -



(1) 1 minute (2) 2 minutes
(3) 4 minutes (4) 16 minutes

13. The dimensional formula for thermal resistance is
(1) $M^{-1}L^{-2}T^{3}\theta$ (2) $M^{-1}L^{-2}T^{-3}\theta$
(3) $ML^{2}T^{-2}\theta$ (4) $ML^{2}T^{2}\theta^{-1}$

14. A spherical body of area A, and emissivity e = 0.6 is kept inside a black body. What is the rate at which energy is radiated per second at temperature T
(1) $0.6\ \sigma AT^4$ (2) $0.4\ \sigma AT^4$
(3) $0.8\ \sigma AT^4$ (4) $1.0\ \sigma AT^4$

15. If temperature of ideal black body increased by 10%, then percentage increase in quantity of radiation emitted from it's surface will be :-
(1) 10% (2) 40% (3) 46% (4) 100%

16. There is a black spot on a body. If the body is heated and carried in a dark room then it glows more. This can be explained on the basis of –
(1) Newton's law of cooling
(2) Wein's law
(3) Kirchhoff's law
(4) Stefan's law

17. Solar constant for earth is 2 cal/min cm^2, if distance of mercury from sun is 0.4 times than distance of earth from sun then solar constant for mercury will be?
(1) 12.5 cal/min cm^2 (2) 25 cal/min cm^2
(3) 0.32 cal/min cm^2 (4) 2 cal/min cm^2

KINETIC THEORY OF GASES

18. The latent heat for vapourisation for 1 gm water is 536 cal. Its value in Joule/kg will be :-
(1) 2.25×10^6 (2) 2.25×10^3
(3) 2.25 (4) None of these

19. During an experiment an ideal gas obeys an addition equation of state P^2V = constant. The initial temperature and pressure of gas are T and V respectively. When it expands to volume 2V, then its temperature will be :
(1) T (2) $\sqrt{2}$ T (3) 2 T (4) $2\sqrt{2}$ T

20. At a given temperature, the pressure of an ideal gas of density ρ is proportional to -
(1) $\frac{1}{\rho^2}$ (2) $\frac{1}{\rho}$ (3) ρ^2 (4) ρ

21. On increasing the temperature of a gas filled in a closed container by 1^0C its pressure increases by 0.4%, then initial temperature of the gas is-
(1) 25^0C (2) 250^0C
(3) 250 K (4) 2500^0C

22. The equation of state for 5g of oxygen at a pressure P and temperature T occupying a volume V, will be :– (where R is the gas constant)
(1) PV = 5 RT (2) PV = (5/2) RT
(3) PV = (5/16) RT (4) PV = (5/32)RT

23. At constant pressure hydrogen is having temperature of 327°C. Till what temperature it is to be cooled so that the rms velocity of its molecules becomes half of the earlier value :-
(1) –123°C (2) 123°C (3) –100°C (4) 0°C

24. The rms velocity of H_2 is 2×10^3 m /sec. What will be the rms velocity of O_2 molecules at the same temperature :-
(1) 10^3 m/sec. (2) 500 m/sec.
(3) 0.5×10^4 m/sec. (4) 3×10^3 m / sec

25. The pressure exerted by a gas in P_0. If the mass of molecules becomes half and their velocities become double, then pressure will become
(1) $\frac{P_0}{2}$ (2) P_0 (3) $2P_0$ (4) $4P_0$

26. According to Maxwell's law of distribution of velocites of molecules, the most probable velocity is :-
(1) greater than the mean velocity
(2) equal to the mean velocity
(3) equal to the root mean square velocity
(4) less than the root mean square velocity

27. Two monoatomic ideal gas at temperature T_1 and T_2 are mixed. There is no loss of energy. If the mass of molecules of the two gases are m_1 and m_2 and number of their molecules are n_1 and n_2 respectively, then temperature of the mixture will be :
(1) $\frac{T_1 + T_2}{n_1 + n_2}$ (2) $\frac{T_1}{n_1} + \frac{T_2}{n_2}$
(3) $\frac{n_2T_1 + n_1T_2}{n_1 + n_2}$ (4) $\frac{n_1T_1 + n_2T_2}{n_1 + n_2}$

28. Relation between the ratio of specific heats (γ) of gas and degree of freedom 'f" will be

(1) $\gamma = f + 2$ (2) $\frac{1}{\gamma} = \frac{1}{f} + \frac{1}{2}$

(3) $f = 2 / (\gamma-1)$ (4) $f = 2(\gamma-1)$

29. Relation between pressure (P) and energy density (E) of an ideal gas is -

(1) $P = 2/3\ E$ (2) $P = 3/2\ E$

(3) $P = 3/5\ E$ (4) $P = E$

30. On mixing 1 gm mole of a monoatomic with 1 gm mole of a diatomic gas the specific heat of mixture at constant volume will be :–

(1) R (2) 3/2 R (3) 2R (4) 5/2R

31. If 2 gm moles of a diatomic gas and 1 gm mole of a mono-atomic gas are mixed then the value of γ (Cp/Cv) for mixture will be :–

(1) $\frac{13}{19}$ (2) $\frac{19}{13}$ (3) $\frac{7}{5}$ (4) $\frac{5}{3}$

32. For a diatomic gas, change in internal energy for unit change in temperature at constant pressure and volume is U_1 and U_2 respectively then $U_1 : U_2$ is :

(1) 5 : 3 (2) 7 : 5 (3) 1 : 1 (4) 5 : 7

33. The specific heat of a gas :

(1) Has only two value Cp and Cv

(2) Has a unique value at a given temperature

(3) Can have any value between 0 and ∞

(4) Depends upon the mass of the gas

34. 22 gm. of CO_2 at 27^0 C is mixed with 16 gm. of O_2 at 37^0 C. The temperature of the mixture is :– (At room temperature, degrees of freedom of CO_2=7 and degrees of freedom of O_2 = 5)

(1) 31.16^0 C (2) 27^0 C

(3) 37^0 C (4) 30^0 C

35. Oxygen and hydrogen gases are at temperature T. Then K.E of molecules of oxygen gas is equal to how many times of K.E. of molecules of hydrogen gas :-

(1) 16 times (2) 8 times

(3) Equal (4) 1/16 times

36. Two balloons are filled, one with pure He gas and the other by air, respectively. If the pressure and temperature of these balloons are same then the number of molecules per unit volume is :-

(1) more in the He filled balloon

(2) same in both balloons

(3) more in air filled balloon

(4) in the ratio of 1 : 4

37. Steam at 100°C is passed into 20 g of water at 10°C. When water acquires a temperature of 80°C, the mass of water present will be :

[Take specific heat of water = 1 cal g^{-1} $°C^{-1}$ and latent heat of steam = 540 cal g^{-1}]

(1) 24 g (2) 31.5 g

(3) 42.5 g (4) 22.5 g

38. The ratio of the specific heats $\frac{C_P}{C_V} = \gamma$ in terms of degrees of freedom (n) is given by :

(1) $\left(1+\frac{n}{3}\right)$ (2) $\left(1+\frac{2}{n}\right)$

(3) $\left(1+\frac{n}{2}\right)$ (4) $\left(1+\frac{1}{n}\right)$

39. A slab of stone of area 0.36 m^2 and thickness 0.1 m is exposed on the lower surface to steam at 100°C. A block of ice at 0°C rests on the upper surface of the slab. In one hour 4.8 kg of ice is melted. The thermal conductivity of slab is :

(Given latent heat of fusion of ice 3.36×10^5 J kg^{-1})

(1) 2.05 J/m/s/°C (2) 1.02 J/m/s/°C

(3) 1.24 J/m/s/°C (4) 1.29 J/m/s/°C

40. What is the slope for an isothermal process in PV indicator diagram :-

(1) $\frac{P}{V}$ (2) $-\frac{P}{V}$ (3) Zero (4) ∞

ANSWER KEY — Exercise-I

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**1**	**1**	**2**	**3**	**4**	**1**	**1**	**2**	**4**	**1**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**1**	**1**	**1**	**1**	**3**	**3**	**1**	**1**	**2**	**4**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**3**	**4**	**1**	**2**	**3**	**4**	**4**	**3**	**1**	**3**
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	**2**	**3**	**3**	**1**	**3**	**2**	**4**	**2**	**4**	**3**