CET SAMPLE QUESTIONS

VISCOSITY, SURFACE TENSION AND THERMAL PROPERTIES OF MATTER

1. Two rods of equal length and diameter but of thermal conductivities 2 and 3 units respectively are joined in parallel. The thermal conductivity of the combination is
   1.1 2.1.5 3.2.5 4.5
2. The amount of thermal radiations emitted from unit area of a perfectly black body in one second say E is related to the absolute temperature T of the body as
   1. EaT 2. EaT^2 3. EaT^3 4. EaT^4
3. The absorption coefficient of thermal radiations for a perfectly black body is
   1.zero 2.less than one 3.1 4.more than one
4. Two stars S_1 and S_2 radiate maximum energy at 360nm and 480nm respectively. Ratio of their absolute temperature is,
   1.3/4 2.4/3 3.9/16 4.16/9
5. Two metallic rods are connected in series. Both are of same material of same length and same area cross-section. If the conductivity of each rod be k, them what will be the conductivity of the combination?
   1.2k 2.k 3.k/2 4.k/4
6. A thin circular copper plate, a sphere and a cube of same mass and material are heated to 100^0C temperature. Now if they are allowed to cool, which one of these three will cool first?
   1.cube 2.thin plate 3.sphere 4.all at same time
7. Three rods of Copper, Brass and Steel are welded together to form a Y shaped structure. Area of cross section of each rod = $4cm^2$. End of copper rod is maintained at 100^0C where as ends of brass and steel are kept at 0^0C. Lengths of the copper, brass and steel rods are 46, 13 and 12 cms respectively. The rods are thermally insulated from surroundings except at ends. Thermal conductivities of copper, brass and steel are 0.92, 0.26 and 0.12 CGS units respectively. Rate of heat flow through copper rod is:
   1. 4.8cal/s 2. 6.0 cal/s 3. 3.2cal/s 4. 2.4cal/s
8. Which of the following rods made of same material will conduct more heat in a given time when their ends are maintained at the same temperature difference
   1. $l = 1m, r = 1cm$ 2. $l = 2m, r = 2cm$
   3. $l = 3cm, r = 1cm$ 4. $l = 100cm, r = 2cm$
9. Two stars A and B of same size, have thermal emissivities of 0.2 and 0.64 respectively. Both stars emit total radiant power at same rate. If the temperature of A is 50000K and the wavelength λ_B corresponding to maximum spectral radiancy in the radiation from B is more than the wavelength λ_A corresponding to maximum spectral radiancy in radiations from A by 2.0 mm, then find the temperature of star B.
   1. 37400K 2. 3740K 3. 3470K 4.34700K
10. Two drops merge to form a single drop. In this case energy is liberated because surface area of the single drop is
    1.less than that of the two drops together
    2. more than that of the two drops together

3. equal that of the two drops together
4. none of these

11. When two soap bubbles of radii r_1 and r_2 $(r_2 = r_1)$ coalesce, the radius of curvature of common surface is

1. $\frac{r_1 r_2}{r_2 - r_1}$ 2. $\frac{r_1 r_2}{r_2 + r_1}$ 3. $\frac{r_2 - r_1}{r_1 r_2}$ 4. infinite

12. Excess pressure inside a soap bubble is three times that of the other bubble. The ratio of their volumes will be

1.1:3 2.1:9 3.1:16 4.1:27

13. A lead sphere of mass 'm' falls in a viscous liquid with a terminal velocity v_0. Another lead sphere of mass 8 m will fall through the same liquid with a terminal velocity

1. v_0 2.4 v_0 3.8 v_0 4.64 v_0

14. A viscous liquid is steadily flowing through a series combination of two capillary tubes, one of length *l* and radius r and the other of radius r/2 and length *l*/2. The ratio of the pressure differences across the two tubes is

1. 1: 2 2.2 : 1 3.1 : 8 4.4 : 1

15. A small ball of mass m and density r falling under gravity in a viscous medium of density r experiences a drag force proportional to the instantaneous speed u such that $F_{drag} = ku$. Then the terminal speed of ball within viscous medium is

1.mg/k 2.mg/2k 3.mg/3k 4.None of these

16. A steel bridge in a town is 200m long. The minimum temperature in winter in the town is 10^0C and the maximum in summer is 40^0C. The change in length of the bridge from winter to summer is ($a_{steel} = 11' 10^{-6} / {}^0C$)

1.3.3cm 2.6.6cm 3.6.6m 4.3.3m

17. If a, b *and* g are co-efficients of linear, superficial and volume expansion respectively then

1. $\frac{b}{a} = \frac{1}{2}$ 2. $\frac{b}{g} = \frac{3}{2}$ 3. $\frac{b}{a} = \frac{g}{b}$ 4.none of these

18. Steel wire of length L at 40^0C is suspended from the ceiling and then a mass 'm' is hung from its free end. The wire is cooled down from 40^0C to 30^0C to regain its original length L. The value of 'm' in kg is nearly ($a = 10^{-5} / {}^0C$; Y=$10^{11} N/m^2$ & $r = 1mm$)

1.2kg 2.4kg 3.6kg 4.3kg

19. Two liquids A and B of equal volumes have their specific heats in the ratio 2:3. If they have same thermal capacity, then the ration of their densities is,

1.1:1 2.2:3 3.3:2 4.5:6

20. Two conductors of the same material have their diameters in the ratio 1:2 and their lengths in the ratio 4:1. If the temperature difference between their ends is the same, then the ratio of amounts of heat conducted per second through them will be

1.4:1 2.1:16 3.8:1 4.1:8

21. A body cools from 70^0C to 50^0C in 5 minutes temperature of the surroundings is 20^0C. Its temperature after 10mins is,

1. 25^0C 2. 30^0C 3. 35^0C 4. 45^0C

22. Two spherical black bodies of radii r_1 & r_2 and with surface temperatures T_1 & T_2 respectively radiate same power. Then r_1/r_2 must be equal to,

1. $\left(\frac{T_1}{T_2}\right)^4$ 2. $\left(\frac{T_1}{T_2}\right)^2$ 3. $\left(\frac{T_2}{T_1}\right)^4$ 4. $\left(\frac{T_2}{T_1}\right)^2$

23. An aluminum meter rod of area of cross section $4cm^2$ with $K = 0.5cal/gm^0C$ is observed that at steady state 360cal of heat flows per minute. The temperature gradient along the rod is,

1. $3^0C/cm$ 2. $6^0C/cm$ 3. $12^0C/cm$ 4. $20^0C/cm$

24. 100g of water at 80^0C is mixed with 50g of water at 20^0C. What is the temperature of the mixture?

1. 40^0C 2. 50^0C 3. 60^0C 4. 70^0C

25. Two rods of lengths L_1 and L_2 are made of materials having coefficients of linear expansion a_1 and a_2 respectively. If L_1 - L_2 is independent of temperature, then which of the following relations is correct?

1. $L_1a_1 = L_2a_2$ 2. $L_1a_2 = L_2a_1$ 3. $L_1L_2 = a_1a_2$ 4.none of these

26. Two rods of different materials having coefficients linear expansion a_1, a_2 and Young's moduli Y_1 and Y_2 respectively are fixed between two rigid massive walls. The rods are heated such that they undergo the same increase in temperature. There is no bending of rods. If $a_1 : a_2$=2:5, the thermal stresses developed in the two rods are equal provided $Y_1 : Y_2$ is equal to

1.2:3 2.1:1 3.5:2 4.5:9

27. When the temperature of a black body increases, it is observed that the wavelength corresponding to maximum energy changes from $0.26mm$ to $0.13mm$. The ratio of the emissive powers of the body at the respective temperature is

1.16/1 2.4/1 3.1/4 4.1/16

28. Water rises in a vertical capillary tube up to a height of 4cm if the tube is inclined at an angle of 60^0 with the vertical, then up to what length the water will rise in the tube?

1.2cm 2.8cm 3. $4/\sqrt{3}$ cm 4. $2/\sqrt{3}$ cm

29. The surface tension of soap solution is $25 \times 10^{-3} Nm^{-1}$. The excess pressure inside a soap bubble of diameter 1cm is

1.5 Pa 2.10 Pa 3.15 Pa 4.20 Pa

30. If the work done in blowing a bubble of volume V is W, then the work done in blowing a bubble of volume 8V from the same soap solution will be

1.2W 2.4W 3.8W 4.16W

ANSWER KEY

Q.NO	ANSWER	Q.NO	ANSWER	Q.NO	ANSWER
1.	*1*	11	*4*	21	*2*
2.	*4*	12	*4*	22	*4*
3.	*3*	13	*2*	23	*1*
4.	*2*	14	*3*	24	*3*
5.	*2*	15	*4*	25	*1*
6.	*2*	16	*2*	26	*3*
7.	*1*	17	*4*	27	*4*
8.	*4*	18	*4*	28	*2*
9.	*1*	19	*3*	29	*4*
10.	*1*	20	*2*	30	*2*