DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 3

Topic :- THERMAL PROPERTIES OF MATTER

1 **(c)**

Variations of density with temperature is given by

$\rho' = \frac{\rho}{1+\gamma\Delta\theta}$

Fraction change is

$\frac{\rho' - \rho}{\rho} = \left[\frac{1}{1+49\times10^{-5}\times30} - 1\right]$

$= 1.5 \times 10^{-2}$

2 **(c)**

$\frac{90-60}{5} = K\left(\frac{90+60}{2} - 20\right) \Rightarrow 6 - K \times 55 \Rightarrow K - \frac{6}{55}$

And, $\frac{60-30}{t} = \frac{6}{55}\left(\frac{60+30}{2} - 20\right) \Rightarrow t = 11$ minute

3 **(a)**

At low temperature short wavelength radiation is emitted. As the temperature rises colour of emitted radiations are in the following order

Red → Yellow → Blue → White (at highest temperature)

4 **(d)**

-200°C to 600°C can be measured by platinum resistance thermometer

5 **(d)**

A thermopile is a sensitive instrument, used for detection of heat radiation and measurement of their intensity

6 **(b)**

When the light emitted from the sun's photosphere passes through it's outer part Chromosphere, certain wave lengths are absorbed. In the spectrum of sunlight, a large number of dark lines are seen called Fraunhoffer lines

8 **(b)**

Heat required to melt 1 g of ice at 0°C to water at 0°C

= 1× 80 cal.

Heat required to raise temperature of 1 g of water from 0°C to 100°C $= 1 \times 1 \times 100$ cal

Total heat required for maximum temperature of 100°C $= 80 + 100 = 180$ cal

As one gram of steam gives 540 cal of heat when it is converted to water at 100°C, therefore, temperature of the mixture would be 100°C

9 **(a)**

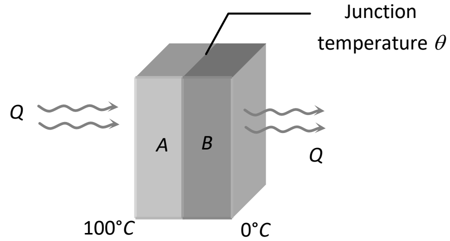
Thermal resistance

$$= \frac{l}{KA} = \left[\frac{L}{MLT^{-3}K^{-1} \times L^2}\right] = [M^{-1}L^{-2}T^3K]$$

10 **(a)**

It is given that $\frac{K_1}{K_2} = \frac{1}{3} \Rightarrow K_1 = K$ then $K_2 = 3K$ the temperature of the junction in contact

$$\theta = \frac{K_1\theta_1 + K_2\theta_2}{K_1 + K_2} = \frac{1 \times 100 + 3 \times 0}{1 + 3} = \frac{100}{4} = 25℃$$



11 **(d)**

If temperature of surrounding is considered then net loss of energy of a body by radiation

$$Q = A\varepsilon\sigma(T^4 - T_0^4)t \Rightarrow Q \propto (T^4 - T_0^4) \Rightarrow \frac{Q_1}{Q_2} = \frac{T_1^4 - T_0^4}{T_2^4 - T_0^4}$$

$$= \frac{(273 + 200)^4 - (273 + 27)^4}{(273 + 400)^4 - (273 + 27)^4} = \frac{(473)^4 - (300)^4}{(673)^4 - (300)^4}$$

12 **(d)**

Due to large specific heat of water, it releases large heat with very small temperature change

13 **(c)**

Rate of cooling $\left(-\frac{dT}{dt}\right) \propto$ emissivity(e)

From the graph,

$$\left(-\frac{dT}{dt}\right)_x > \left(-\frac{dT}{dt}\right)_y$$

$\therefore \quad e_x > e_y$

Further emissivity $(e) \propto$ absorptive power (a) (good absorbers are good emitters also)

$\therefore \quad a_x > a_y$

14 **(a)**

$$\frac{Q_1}{Q_2} = \frac{r_1^2T_1^4}{r_2^2T_2^4} = \frac{4^2}{1^2} \times \left(\frac{2000}{4000}\right)^4 = 1$$

15 **(b)**

In convection, the heated lighter particles move upwards and colder heavier particles move downwards to their place. This depends on weight and hence, on gravity.

16 **(a)**

The temperature of the body is same that of its surroundings, so the amount of heat absorbed by it should be equal to amount of heat radiated by it.

17 **(b)**

$$\lambda_m \propto \frac{1}{T} \Rightarrow \lambda_{m_1}T_1 = \lambda_{m_2}T_2$$

$$\Rightarrow T_2 = \frac{\lambda_{m_1}T_1}{\lambda_{m_2}} = \frac{1.4 \times 10^{-6} \times 1000}{2.8 \times 10^{-6}} = 500\ K$$

18 **(a)**

$$\frac{Q_2}{Q_1} = \left(\frac{T_2}{T_1}\right)^4 = \left(\frac{273+927}{273+327}\right)^4 = \left(\frac{1200}{600}\right)^4 = 16$$

$$\Rightarrow Q_2 = 32\ KJ$$

19 **(d)**

$$\frac{Q}{t} = \frac{KA(\theta_1 - \theta_2)}{l} \Rightarrow \frac{mL}{t} = \frac{KA(\theta_1 - \theta_2)}{l}$$

$\Rightarrow K \propto \frac{1}{t}$ [∵ remaining quantities are same]

$$\Rightarrow \frac{K_1}{K_2} = \frac{t_2}{t_1} = \frac{40}{20} = \frac{2}{1}$$

20 **(b)**

Suppose person climbs upto height h, then by using

$W = JQ \Rightarrow mgh = JQ$

$$\Rightarrow 60 \times 9.8 \times h = 4.2 \times \left(10^5 \times \frac{28}{100}\right) \Rightarrow h = 200\ m$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	C	A	D	D	B	A	B	A	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	D	D	C	A	B	A	B	A	D	B