# Thermal Expansion

**1.** The coefficient of linear expansion of crystal in one direction is $\alpha_1$ and that in every direction perpendicular to it $\alpha_2$. The coefficient of cubical expansion is

(a) $\alpha_1 + \alpha_2$ (b) $2\alpha_1 + \alpha_2$ (c) $\alpha_1 + 2\alpha_2$ (d) None of these

**2.** A system *S* receives heat continuously from an electrical heater of power 10 *W*. The temperature of *S* becomes constant at 50°*C* when the surrounding temperature is 20°*C*. After the heater is switched off, *S* cools from 35.1°*C* to 34.9°*C* in 1 *minute*. The heat capacity of *S* is

(a) $750\ J(°C)^{-1}$ (b) $1500\ J(°C)^{-1}$ (c) $3000\ J(°C)^{-1}$ (d) $6000\ J(°C)^{-1}$

**3.** An immersion heater takes time $t_1$ to raise the temperature of a mass *M* of a liquid from a temperature $T_1$ to its normal boiling point $T_2$. In a further time $t_2$, a mass *m* of the liquid is vaporized. If the specific heat capacity of the liquid is *c* and heat losses to the atmosphere and to the containing vessel are ignored, the specific latent heat of vaporisation is

(a) $\frac{Mc(T_2 - T_1)t_2}{mt_1}$ (b) $\frac{mc(T_2 - T_1)t_2}{MT_1}$ (c) $\frac{McT_1T_2}{mt_1}$ (d) $\frac{mt_1}{Mc(T_2 - T_1)t_2}$

**4.** Three liquids of equal volumes are thoroughly mixed. If their specific heats are $s_1, s_2, s_3$ and their temperatures $\theta_1, \theta_2, \theta_3$ and their densities $d_1, d_2, d_3$ respectively, then the final temperature of the mixture is

(a) $\frac{s_1\theta_1 + s_2\theta_2 + s_3\theta_3}{d_1s_1 + d_2s_2 + d_3s_3}$ (b) $\frac{d_1s_1\theta_1 + d_2s_2\theta_2 + d_3s_3\theta_3}{d_1s_1 + d_2s_2 + d_3s_3}$

(c) $\frac{d_1s_1\theta_1 + d_2s_2\theta_2 + d_3s_3\theta_3}{d_1\theta_1 + d_2\theta_2 + d_3\theta_3}$ (d) $\frac{d_1\theta_1 + d_2\theta_2 + d_3\theta_3}{s_1\theta_1 + s_2\theta_2 + s_3\theta_3}$

**5.** 1 *g* of ice at 0°*C* is mixed with 1*g* of steam at 100°*C*. After thermal equilibrium is attained the temperature of the mixture is

(a) 1°*C* (b) 50°*C* (c) 81°*C* (d) 100°*C*

**6.** A 50 *gm* piece of iron at 100°*C* is dropped into 100 *gm* water at 20°*C*. The temperature of mixture 25.5°*C*. The specific heat of iron in *Calorie*/*gm°C* will be

(a) 0.341 (b) 0.267 (c) 0.082 (d) 0.148

**7.** 1 *gm* steam at 100°*C* can melt how much ice at 0°*C*

(a) $\frac{80}{540}\ gm$ (b) $\frac{540}{80}\ gm$ (c) 8 *gm* (d) 8 *kg*

**8.** The melting of solids under atmospheric pressure is

(a) An isometric change (b) An isobaric change

(c) Both isobaric and isothermal change (d) An adiabatic change

**9.** A body of mass *m* gram has specific heat *c*

(a) Heat capacity of the body is *mc* (b) Water equivalent of the body is *m*

(c) Water equivalent of the body is *mc* (d) Heat capacity of the body is *c*

**10.** A metal rod of length $L_0$, made of material of Young's modulus *Y*, area *A* is fixed between two rigid supports. The coefficient of linear expansion of the rod is $\alpha$. The rod is heated such that the tension in the rod is *T*

(a) $T \propto L_0$ (b) $T \propto A_0^0$ (c) $T \propto A$ (d) $T \propto L_0^0$

**11.** A one litre glass flask contains some mercury. It is found that at different temperatures the volume of air inside the flask remains the same. What is the volume of mercury in this flask if coefficient of linear expansion of glass is $9 \times 10^{-6}/°C$ while of volume expansion of mercury is $1.8 \times 10^{-4}/°C$

(a) 50 *cc* (b) 100 *cc* (c) 150 *cc* (d) 200 *cc*

**12.** If the length of a cylinder on heating increases by 2%, the area of its base will increase by

(a) 0.5% (b) 2% (c) 1% (d) 4%

**13.** A thin wire of length *L* increases in length by 1% when heated to a certain range of temperature. If a thin copper plate of area $2L \times L$ is heated through same range the percentage increase in area will be

(a) 3% (b) 2.5% (c) 1.5% (d) 2%

**14.** A constant volume gas thermometer shows pressure reading of 50 *cm* and 90 *cm* of mercury at 0°*C* and 100°*C* respectively. When the pressure reading is 60 *cm* of mercury., the temperature is

(a) 25°*C* (b) 40°*C* (c) 15°*C* (d) 12.5°*C*

**15.** The relation that converts temperature in Celsius scale to temperature in Fahrenheit scale is

(a) $t°F = \frac{5}{9}(t°C - 32°)$ (b) $t°F = \frac{5}{9}t°C + 32°$ (c) $t°F = \frac{9}{5}t°C + 32°$ (d) $t°F = \frac{9}{5}(t°C + 32°)$