

Date Planned : __ / __ / __	Daily Tutorial Sheet - 6	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level - 1	Exact Duration : _____
Topics covered : <i>Mixed (Numerical Questions)</i>		

- 76.** A wire of length 1 m and area of cross section $2 \times 10^{-6} \text{ m}^2$ is suspended from the top of a roof at one end and a load of 20 N is applied at the other end. If the length of the wire is increased by $0.5 \times 10^{-4} \text{ m}$, calculate its Young's modulus (in 10^{11} N/m^2).
- 77.** A block of mass m produces an extension of 9 cm in an elastic spring of length 60 cm when it is hung by it, and the system is in equilibrium. The spring is cut in two parts of 40 cm and 20 cm lengths. The same block hangs in equilibrium with the help of these two parts connected in parallel. Find the extension (in cm) in this case. 
- 78.** A body of mass 10 kg is connected to a wire of length 0.3 m and of across-sectional area 10^{-6} m^2 . Its breaking strength is $4.8 \times 10^7 \text{ N/m}^2$. Find the maximum angular velocity with which it can be rotated in a horizontal circle without breaking (in rad/sec).
- 79.** A body is cooled in 2 min in a room at temperature of 30°C from 75°C to 65°C . If the same body is cooled from 55°C to 45°C in the same room, find the time taken (in minute).
- 80.** Four cylindrical rods of same material with lengths and radii (ℓ, r) , $(2\ell, r)$, $(2\ell, 2r)$ and $(\ell, 2r)$ are connected between two reservoirs at 0°C and 100°C . Find the ratio of the maximum to minimum rate of conduction in them. 
- 81.** A clock with a metallic pendulum at 15°C runs faster by 5 s each day and at 30°C , runs slow by 10 s . Find the coefficient of linear expansion of the metal. (Nearly in $10^{-5}/^\circ\text{C}$)
- 82.** Two spherical bodies A (radius 6 cm) and B (radius 18 cm) are at temperature T_1 and T_2 respectively. The maximum intensity in the emission spectrum of A is at 500 nm and in that of B is at 1500 nm . Considering them to be black bodies, what will be the ratio of the rate of total energy radiated by A to that of B ?
- 83.** A solid sphere of radius R made of a material of bulk modulus B is surrounded by a liquid in a cylindrical container. A massless piston of area A (the area of container is also A) floats on the surface of the liquid. When a mass M is placed, fractional change in radius of the sphere is $\frac{3Mg}{nAB}$. Find the value of n .
- 84.** A clock with a metallic pendulum at 15°C runs faster by 5 sec each day and at 30°C , runs slow by 10 sec . The coefficient of linear expansion of the metal is $n \times 10^{-6}/^\circ\text{C}$ where the value of n in nearest integer is ____.
- 85.** 2 kg of ice at -20°C is mixed with 5 kg of water at 20°C in an insulating vessel having a negligible heat capacity. Calculate the final mass of water remaining in the container (in kg). Given: specific heat capacities of water and ice are $1\text{ cal/g } ^\circ\text{C}$ and $0.5\text{ cal/g } ^\circ\text{C}$ respectively, latent heat of fusion of ice is 80 cal/g .

86. A body is cooled in 2 min in a room at temperature of 30°C from 75°C to 65°C . If the same body is cooled from 55°C to 45°C in the same room, find the time taken (in minute).
87. Two identical conducting rods are first connected independently to two vessels, one containing water at 100°C and the other containing ice at 0°C . In the second case, rods are joined end to end and are connected to the same vessels. If q_1 and q_2 (in g/sec) are the rates of melting of ice in two cases, then find the ratio of q_1/q_2 . 
88. A rubber eraser $3\text{ cm} \times 1\text{ cm} \times 8\text{ cm}$ is clamped at one end with 8 cm edge as vertical. A horizontal force $F = 2.1\text{ N}$ is applied on the free surface. Shear modulus of rubber $= 1.4 \times 10^5 \text{ Nm}^{-2}$. The horizontal displacement (in mm) of the top face is x . Find x .
89. A composite rod is made by joining a copper rod, end to end with a second rod of a different material but of the same cross section. At 25°C , the composite rod is 1 m in length of which the length of the copper rod is 30 cm . At 125°C , the length of the composite rod increases by 1.91 mm . The coefficient of linear expansion of copper is $\alpha = 1.7 \times 10^{-5} \text{ per } ^{\circ}\text{C}$ and that of the second rod is $\beta = n \times 10^{-5} \text{ per } ^{\circ}\text{C}$. Find the value of n . 
90. The breaking stress for a metal is $9 \times 10^{10} \text{ Nm}^{-2}$. The density of the metal is 9000 kg m^{-3} . If $g = 10 \text{ N kg}^{-1}$, the maximum length of the wire made of this metal which may be suspended without breaking is 10^k m . Find the value of k .