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### **H & T Practice Problems-1** **Thermal Expansion**

Q.1. A rod of length 20 cm is made of metal. It expands by 0.075cm when its temperature is raised from 0°C to 100° C. Another rod of a different metal B having the same length expands by 0.045 cm for the same change in temperature, a third rod of the same length is compared of two parts one of metal A and the other of metal B. This rod expands by 0.060 cm for the same change in temperature. The portion made of metal A has the length

- (A) 20 cm                      (B) 10 cm                      (C) 15 cm                      (D) 18 cm

Q.2. A crystal has a coefficient of expansion  $13 \times 10^{-9}$  in one direction and  $231 \times 10^{-9}$  in every direction at right angles to it. Then the cubical coefficient of expansion is

- (A)  $4.62 \times 10^{-7}$                       (B)  $2.44 \times 10^{-7}$                       (C)  $4.75 \times 10^{-7}$                       (D)  $2.57 \times 10^{-7}$

Q.3. A container is filled with water at 4°C. At one time the temperature is increased by few degrees above 4°C and at the other time it is decreased by few degrees below 4°C. One shall observe that

- (A) The level remains constant in each case.  
(B) Water overflows in both cases.  
(C) Water overflows in later case, while come down in the previous case.  
(D) In previous case water overflows while in later case its level comes down.

Q.4. A sphere of diameter 7 cm and mass 266.5gm floats in a bath of a liquid. As the temperature is raised, the sphere just begins to sink at a temperature 35°C. If the density of a liquid at 0°C is 1.527 gm/cc, then neglecting the expansion of the liquid is

- (A)  $8.486 \times 10^{-4} / ^\circ\text{C}$                       (B)  $8.486 \times 10^{-5} / ^\circ\text{C}$   
(C)  $8.486 \times 10^{-6} / ^\circ\text{C}$                       (D)  $8.486 \times 10^{-3} / ^\circ\text{C}$

Q.5. The volume of the bulb of a mercury thermometer at 0°C is  $V_0$  and cross section of the capillary is  $A_0$ . The coefficient of linear expansion of glass is  $\alpha_g$  per °C and the cubical expansion of mercury  $\gamma_m$  per °C. If the mercury just fills the bulb at 0°C, what is the length of mercury in capillary at T °C

- (A)  $\frac{V_0 T (\gamma_m + 3\alpha_g)}{A_0 (1 + 2\alpha_g T)}$                       (B)  $\frac{V_0 T (\gamma_m - 3\alpha_g)}{A_0 (1 + 2\alpha_g T)}$

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**AN Whitehead**



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