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DPP – Thermal Expansion

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Q 1. The co-efficient of linear expansion of iron is 11/180 of volume coefficient of expansion of mercury which is 18×10^{-5} /°C. An iron rod is 10m long at 27 °C. The length of the rod will be decreased by 1.1mm then the temperature of the rod changes by:

(a) 0 °C (b) 10 °C

(c) 20 °C (d) 170 °C

Q 2. At 50 °C, a brass rod has a length 50 cm and a diameter 2 mm. It is joined to a steel rod of the same length and diameter at the same temperature. The change in the length of the composite rod when it is heated to 250 °C is: (Coefficient of linear expansion of brass = 2×10^{-5} /°C, coefficient of linear expansion of steel = 1.2×10^{-5} /°C)

(a) 0.28 cm (b) 0.30 cm

(c) 0.32 cm (d) 0.34 cm

Q 3. A rod of length 2 m is at a temperature of 20 °C. find the free expansion of the rod, if the temperature is increased to 50 °C:

($\alpha = 15 \times 10^{-6}$/°C)

(a) 0.9 mm (b) 9 mm

(c) 9 cm (d) 1.9 mm

Q 4. Density of substance at 0 °C is 10 gm/cc and at 100°C, its density is 9.7 gm/cc. The coefficient of linear expansion of the substance will be:

(a) 10^{2} (b) 10^{-2}

(c) 10^{-3} (d) 10^{-4}

Q 5. The coefficient of volume expansion of a liquid is 4.9×10^{-4} /K. Calculate the fractional change in its density when the temperature is raised by 30 °C:

(a) 1.5×10^{2} (b) 1.5×10^{-2}

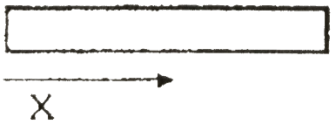
(c) 1.5×10^{-3} (d) 1.5×10^{-4}

Q 6. A steel tape 1m long is correctly calibrated for a temperature of 27 °C. The length of a steel rod measured by this tape is found to be 63.0 cm on a hot day when the temperature is 45 °C. Coefficient of linear expansion of steel = 1.20×10^{-5} /K. what is the actual length of the steel rod on that day?

(a) 63.0136cm (b) 63.2134cm

(c) 63.1526cm (d) 63.3136cm

Q 7. A rod has variable co-efficient of linear expansion $\alpha = \frac{x}{5000}$ (x is in metre). If length of the rod is 1m. Determine increase in length of the rod in (cm) on increasing temperature of the rod by 100 °C:



(a) 1.01 (b) 0.1
(c) 0.01 (d) 1

Q 8. The coefficient of linear expansion of a crystal in one direction is α_1 and hat in every direction perpendicular to it is α_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 above

Q 9. Coefficient of volume expansion of mercury is 0.18×10^{-3}/°C. If the density of mercury at 0 °C is 13.6 g/cc then its density at 200 °C is:
(a) 13.11 g/cc (b) 52.11 g/cc
(c) 16.11 g/cc (d) 26.11 g/cc

Q 10. The real coefficient of volume expansion of glycerin is 0.000597 /°C and linear coefficient of expansion of glass is 0.000009 /°C. Then the apparent volume coefficient of expansion of glycerin in a container of glass is:
(a) 0.000558 /°C (b) 0.00057 /°C
(c) 0.00027 /°C (d) 0.00066 /°C

Q 11. The coefficient of linear expansion of a metal is 1×10^{-5}/°C. The percentage increase in area of a square plate of that metal when it is heated through 100 °C is:
(a) 0.02% (b) 0.1%
(c) 0.001% (d) 0.2%

Q 12. A metal plate of area 1.2 m^2 increases its area by 2.4×10^{-4} m^2 when it is heated from 0 °C to 100 °C. The coefficient of cubical expansion of the metal expressed in per °C is:
(a) 2×10^{-6} (b) 4×10^{-6}
(c) 6×10^{-6} (d) 3×10^{-6}

Q 13. The length of a metal rod at 0 °C is 0.5 m. When it is heated, its length increases by 2.7mm. The final temperature of rod is (coeff. Of linear expansion of metal = 90×10^{-6}/°C):
(a) 20 °C (b) 30 °C
(c) 40 °C (d) 60 °C

Q 14. A liquid with coefficient of volume expansion γ is filled in a container of a material having coefficient of linear expansion α. If the liquid overflows on heating, then:
(a) $\gamma = 3\alpha$ (b) $\gamma > 3\alpha$

(c) $\gamma < 3\alpha$ (d) $\gamma = \alpha^3$

Q 15. At 20 °C a liquid is filled upto 10 cm height in a container of glass of length 20cm and cross-sectional area 100 cm^2. Scale is marked on the surface of container. This scale gives correct reading at 20 °C. Given $\gamma_L = 5 \times 10^{-5}$ /K, $\alpha_g = 1 \times 10^{-5}$/°C. The actual height of liquid at 40°C is:

(a) 10.01 cm (b) 10.006 cm
(c) 10.6 cm (d) 10.1 cm

Q 16. A uniform metal rod is used as a bar pendulum. If the room temperature rises by 10°C, and the coefficient of linear expansion of the metal of the rod is 2×10^{-6} per °C, the period of the pendulum will have percentage increase of:

time period of pendulum is given by $T = 2\pi\sqrt{\frac{l}{g}}$

(a) -2×10^{-3} (b) 1×10^{-3}
(c) -1×10^{-3} (d) 2×10^{-3}

Answer Key

Q.1 b	**Q.2 c**	**Q.3 a**	**Q.4 d**	**Q.5 b**
Q.6 a	**Q.7 d**	**Q.8 c**	**Q.9 a**	**Q.10 b**
Q.11 d	**Q.12 d**	**Q.13 d**	**Q.14 b**	**Q.15 b**
Q.16 b				