

Question #80114, Physics / Other

a) Calculate the increase in volume of 100cm³ of mercury when its temperature changes from 10°C to 35°C. The volume coefficient of expansion of mercury, B is 0.00018°C⁻¹

Solution

$$\Delta V = \beta \Delta T V = (0.00018)(35 - 10)(100) = 0.45 \text{ cm}^3.$$

b) Determine the change in volume of a block of cast iron 5.0cm × 10cm × 6.0cm, when the temperature changes from 15°C to 47°C. The coefficient of linear expansion, a for cast iron is 0.000010°C⁻¹.

Solution

$$\Delta V = 3\alpha \Delta T V = 3(0.000010)(47 - 15)(5)(6)(10) = 0.29 \text{ cm}^3.$$

c) A glass flask is filled "to the mark" with 50.00cm³ of mercury at 18°C. If the flask and its contents are heated to 38°C, how much mercury will be above the mark? The coefficient of linear expansion a, for glass is 9.0 × 10⁻⁶°C⁻¹ and the coefficient of volume expansion, B for mercury is 182×10⁻⁶°C⁻¹.

Take B = 3a glass as a good approximation

- i) Determine the change in volume of the mercury
- ii) Determine the change in volume of the glass
- iii) Calculate how much mercury will be above the mark

Solution

i)

$$\Delta V_m = \beta \Delta T V = (0.000182)(38 - 18)(50) = 0.182 \text{ cm}^3.$$

ii)

$$\Delta V_g = 3\alpha \Delta T V = 3(0.000009)(38 - 18)(50) = 0.027 \text{ cm}^3.$$

iii)

$$V = \Delta V_m - \Delta V_g = 0.182 - 0.027 = 0.155 \text{ cm}^3.$$

Answer provided by <https://www.AssignmentExpert.com>