Class 11 Physics · Chapter 10: Thermal Properties of Matter

Worksheet · 20 marks · about 40 minutes · based on NCERT

Name _____ Class and section _____ Date _____

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1. A beaker of pure water at 0 °C is warmed slowly to 8 °C. Over this range its density [1]

(a) increases throughout (b) decreases throughout
(c) first decreases, then increases (d) first increases, then decreases

2. Rods of equal length made of iron ($\alpha_l = 1.2 \times 10^{-5}\ K^{-1}$), aluminium ($2.5 \times 10^{-5}\ K^{-1}$), copper ($1.7 \times 10^{-5}\ K^{-1}$) and brass ($1.8 \times 10^{-5}\ K^{-1}$) are heated through the same rise in temperature. The rod that lengthens the most is the one made of [1]

(a) iron (b) aluminium
(c) copper (d) brass

3. An aluminium rod 2.0 m long is heated from 20 °C to 120 °C ($\alpha_l = 2.5 \times 10^{-5}\ K^{-1}$). Its length increases by [1]

(a) 0.5 mm (b) 2.5 mm
(c) 5.0 mm (d) 50 mm

4. An ideal gas is heated at constant pressure. At 27 °C its coefficient of volume expansion is about [1]

(a) $3.7 \times 10^{-3}\ K^{-1}$ (b) $3.7 \times 10^{-2}\ K^{-1}$
(c) $1.1 \times 10^{-3}\ K^{-1}$ (d) $3.3 \times 10^{-3}\ K^{-1}$

5. The temperature of a room rises from 18 °C to 43 °C. The rise in temperature on the Kelvin scale is [1]

(a) 25 K (b) 298.15 K
(c) 45 K (d) 316.15 K

6. Equal volumes of ethanol and mercury are warmed through the same rise in temperature. With $\alpha_v(\text{ethanol}) = 110 \times 10^{-5}\ K^{-1}$ and $\alpha_v(\text{mercury}) = 18.2 \times 10^{-5}\ K^{-1}$, find the ratio of their increases in volume. In two thermometers with identical bulbs and bores, which liquid gives the longer length per degree? [2]

7. Name two features of a Dewar flask (thermos bottle) and, for each, the mode of heat transfer it reduces. [2]

8. What is sublimation? Name two substances that sublime at normal atmospheric pressure, and state how the solid and vapour are related while the change takes place. [2]

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9. A hot plate of surface area 0.050 m^2 and emissivity 0.80 is kept at 500 K by an electric heater, in a room whose walls are at 300 K. Radiation is the only loss. ($\sigma = 5.67 \times 10^{-8}$ W m^{-2} K^{-4}) (a) Find the power the plate radiates. (b) Find the heater power needed to keep the plate at 500 K. (c) By what factor must the heater power rise to keep the plate at 600 K instead? [3]

10. A copper rod and a pyrex glass rod are each 1.000 m long at 20 °C. Both are heated to 120 °C. With α_l(copper) = 1.7×10^{-5} K^{-1} and α_l(pyrex) = 0.32×10^{-5} K^{-1}, find (a) the increase in length of each rod and (b) how many times the copper's increase is the glass's. (c) State why pyrex glassware is preferred for heating in a laboratory. [3]

11. 0.50 kg of a solid is heated by a 200 W heater, all of whose heat goes into the substance. Its temperature rises, then stays at 80 °C for 4.0 minutes, and then rises again, the liquid warming by 20 °C in 50 s. (a) What is happening during the 4.0 minutes? (b) Find the latent heat of fusion of the substance. (c) Find the specific heat capacity of the liquid. [3]