

5.1 - Thermometers

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- (1999) What do you understand by the term: Triple point of water
- (1999) The resistance of a platinum wire at a temperature $T^{\circ}\text{C}$ measured on a gas scale is given by $R(T) = R_0(1 + aT + bT^2)$.
 - What temperature will the platinum thermometer indicate when the temperature on the gas scale is 200°C ? (take $a = 3.8 \times 10^{-3}$ and $b = -5.6 \times 10^{-7}$)
- (2000) What does one require in order to establish a scale of temperature?
- (2000) A copper-constantan thermocouple with its cold junction at 0°C had an emf of 4.28 mV when its other hot junction was at 100°C . The emf became 9.29 mV when the temperature of the hot junction was 200°C . If the emf E is related to the temperature difference θ between hot and cold junctions by the equation $E = A(\theta) + B(\theta^2)$, calculate:
 - The values of A and B .
 - The range of temperature for which E may be assumed proportional to θ without incurring an error of more than 1% .
- (2000) The resistance R , of a platinum varies with temperature t according to the equation $R_t = R_0(1 + 8000bt - bt^2)$ where b is a constant. Calculate the temperature on platinum scale corresponding to 400°C on the gas scale.
- (2000) Heat is supplied at a rate of 80 W to one end of a well lagged copper bar of uniform cross section area 10 cm² having a total length of 20 cm. The heat is removed by water cooling at the other end of the bar. Temperature recorded by two thermometers T_1 and T_2 at distances 5 cm and 15 cm from the hot end are 48°C and 28°C respectively.
 - Calculate the thermal conductivity of copper.
 - Estimate the rate of flow (in g/min) of cooling water sufficient for the water temperature to rise 5 K.
 - What is the temperature at the cold end of the bar?
- (2007) What is meant by a thermometric property of a substance?
- (2007) What qualities make a particular property suitable for use in practical thermometers?
- (2007) Explain why at least two (2) fixed points are required to define a temperature scale.
- (2007) Mention the type of thermometer which is most suitable for calibration of thermometers.

- (2010) In a special type thermometer a fixed mass of a gas has a volume of 100 cm^3 at a pressure of 81.6 cmHg at the ice point and volume of 124 cm^3 and pressure of 90 cmHg at steam point. Determine the temperature if its volume is 120 cm^3 and pressure of 85 cmHg .
 - What value does the scale of this thermometer give for absolute
 - zero?
- (2013) Name the temperature of a thermocouple at which the thermo,
 - e.m.f. changes its sign.
 - electric power becomes zero.
- (2013) A Nichrome-constantan thermocouple gives about $70 \mu\text{V}$ for each 1°C difference in temperature between the junctions. If 100 such thermocouples are made into a thermopile, what voltage is produced when the junctions are at 20°C and 240°C ?
- (2014) What is meant by temperature of inversion?
- (2014) A thermometer was wrongly calibrated as it reads the melting point of ice as -10°C and reading a temperature of 60°C in place of 50°C . What would be the temperature of boiling point of water on this scale?
- (2015) What is meant by a thermometric property?
- (2015) Mention three qualities that make a particular property suitable for use in a practical thermometer.
- (2016) Briefly describe the working principle of a thermocouple.
- (2016) In a certain thermocouple thermometer the e.m.f. is given by $E = a\theta + 1/2b\theta^2$ where θ is the temperature of hot junction. If $a = 10 \text{ mV}^\circ\text{C}^{-2}$, $b = -1/20 \text{ mV}^\circ\text{C}^{-2}$ and the cold junction is at 0°C , calculate the neutral temperature.
- (2017) The value of the property X of a certain substance is given by $X_\theta = X_0 + 0.5\theta + 2 \times 10^{-4}\theta^2$, Where θ is the temperature in degree Celsius. What would be the Celsius temperature defined by the property X which corresponds to a temperature of 50°C on this gas thermometer scale?
- (2018) Which type of thermometer is most suitable for calibration of other thermometers?
- (2018) Why at least two fixed points are required to define a temperature scale?
- (2018) List two qualities which makes a particular property suitable for use in practical thermometers.
- (2018) Describe how mercury in glass thermometer could be made sensitive.
- (2018) What is meant by triple point of water?
- (2018) Evaluate the temperature in Kelvin if the pressure recorded by a constant volume gas thermometer is $6.8 \times 10^4 \text{ Nm}^{-2}$ given that the pressure at triple point 273.16 K is $4.6 \times 10^4 \text{ Nm}^{-2}$.
- (2019) A thermometer has wrong calibration as it reads the melting point of ice as -10°C . If it reads 40°C in a place where the temperature reads 30°C , determine the boiling point of water on this scale.