



## PHYSICS

# BOOKS - BHARATI BHAWAN PHYSICS (HINGLISH)

## THERMOMETRY

Others

1. The pressure of air in a constant volume gas thermometer is  $0.8m$  and  $1.093m$  at  $0^{\circ}C$

and  $100^{\circ}C$ , respectively. When the bulb is placed in a hot bath, the pressure is  $1m$ .

Calculate the temperature of the bath



[Watch Video Solution](#)

2. The resistance of a certain platinum resistance thermometer is found to be 2.56 ohms at  $0^{\circ}C$ , 2.56 ohms at  $100^{\circ}C$  and 6.78 ohms at  $444.6^{\circ}C$  (the boiling point of sulphur on the perfect gas scale). Calculate the

temperature of the bath in which the platinum resistance is 5.06 ohms.



[View Text Solution](#)

3. If the ideal gas temperature at the steam point is  $373.15K$ , what is the limiting value of the ratio of pressure of a gas at the steam point and at the triple point of water, when the gas is kept at constant volume?



[Watch Video Solution](#)

4. The susceptibility of a paramagnetic gas varies as  $\chi = \frac{c}{T}$  where  $T$  is the absolute temperature of the substance. If the value of its susceptibility at the triple point is  $140 \times 10^{-8}$  and at an unknown temperature  $428 \times 10^{-8}$ , what is the unknown temperature defined on the basis of this property (call it magnetic scale)? What is the correct temperature on the absolute scale and the Celsius scale?



**Watch Video Solution**

5. A certain platinum resistance thermometer has a resistance of 90.35 ohms when its bulb is placed in a triple-point cell. What is the temperature on the platinum scale when its resistance is 96.28 ohms? What is the correct temperature on the Celsius and the thermodynamic scale if the resistance varies as  $R = R_0(1 + 0.004t)$ ?



[View Text Solution](#)

6. The pressure indicated by a constant volume hydrogen thermometer are  $2.235m$ ,  $0.75m$  and  $1.024m$  of mercury when the bulb is immersed in a hot bath, ice and steam respectively. What is the temperature of the hot bath?



[Watch Video Solution](#)

7. The volumes of a perfect gas enclosed in the bulb of a constant pressure thermometer

are  $1m^3$  and  $2m^3$  at the ice point and boiling of water at normal pressure. What is the temperature of the bath in which its volume is  $0.75m^3$ ?



[Watch Video Solution](#)

8. The pressure indicated by a constant volume hydrogen thermometer are  $23.5cm$ ,  $75cm$  and  $102.4cm$  in liquid air, ice and steam, respectively. What is the temperature of liquid air?



Watch Video Solution

9. A constant volume air thermometer is used to determine the temperature of a furnace and the excess pressure in the bulb is found to be equal to  $152 \times 10^{-2} m$  of mercury. At  $0^\circ C$  the pressure in the bulb is equal to that of the atmosphere. If the barometric height throughout the experiment is  $76 \times 10^{-2} m$  of mercury, calculate the temperature of the furnace.



Watch Video Solution



**10.** The resistance of a platinum thermometer at  $0^{\circ}C$ ,  $100^{\circ}C$  and  $203^{\circ}C$  is found to be 3.5, 5.2 and 6.9 ohms respectively. Find the temperature at which the resistance of the thermometer is 9.4 ohms.



**View Text Solution**

**11.** The platinum wire has resistance of 2 ohms at the temperature of melting ice, 2.778 ohms at temperature of boiling water under

standard pressure and 2.54 ohms at the boiling point of a liquid. Find the platinum scale temperature ( $t_p$ ) and the corresponding correct temperature ( $t$ ). Assume  $\delta = 1.5$  for pure platinum.



[View Text Solution](#)

12. Calculate the temperature at which platinum scale temperature does not require any correction.



[View Text Solution](#)

**13.** A certain mass of gas has a volume of  $3 \times 10^{-4}$  cubic metre when its pressure is  $1m$  of mercury and its temperature is  $0^\circ C$ . When heated to  $100^\circ C$  the volume of the gas becomes  $3.2 \times 10^{-4} m^3$  and the pressure  $1.29m$ . What is the temperature at which the volume is  $3.3 \times 10^{-4} m^3$  and pressure  $1.4m$  of mercury?



**Watch Video Solution**

**14.** A platinum resistance thermometer has a resistance 11 ohms at the ice point, 15.247 ohms at the steam point and 28.887 ohms at the sulphur point ( $444.6^{\circ}C$ ). Find the first and second temperature coefficient of platinum.



**View Text Solution**

**15.** If the resistance of a platinum thermometer at  $0^{\circ}C$ ,  $100^{\circ}C$  and at the

boiling point of sulphur ( $444.6^\circ C$ ) be 3.6, 4.6 and 7.82 ohms respectively, calculate the true temperature at which the resistance of the thermometer is 6.6 ohms.



[View Text Solution](#)

**16.** The magnetic susceptibility of a paramagnetic substance changes with absolute temperature as  $\chi = \frac{c}{T - 223^\circ}$  when  $T > 223$  and  $c$  is a constant. Derive an expression for the Celsius temperature  $t$  based

on this property and establish the relation between  $t$  and  $T$ . What is the value of  $t$  corresponding to  $T = 423K$ ? Take ice point  $= 273K$



[View Text Solution](#)

**17.** The thermo emfs of a thermocouple at the triple point and steam point are  $4mV$  and  $5.4mV$ , respectively. Calculate the temperature on the thermo-electric scale. What are the corresponding temperatures on

the thermodynamic and Celsius scales if the variation of thermo emfs is governed by  $e = 0.014t + 4$  when the emfs are in millivolts?



[View Text Solution](#)

**18.** The temperature  $T$  on thermodynamic scale is defined in terms of a property  $p$  by the relation  $T = a \ln p + b$  where  $a$  and  $b$  are constants. The temperature of the ice point and steam point are assigned the numbers 32

and 212 respectively and the values of  $p$  at these temperatures are 1.86 and 6.81 respectively. Calculate the temperature on this scale when  $p = 2.50$



**Watch Video Solution**