

The thermo emf of a thermocouple varies with the temperature θ of the hot junction as $E = a\theta + b\theta^2$ in volts where the ratio a/b is 700°C . If the cold junction is kept at 0°C , then the neutral temperature is

A. 700°C

B. 350°C

C. 1400°C

D. no neutral temperature is possible for this thermocouple.

$$E = a\theta + \frac{1}{2}b\theta^2$$

\therefore At neutral temperature $\frac{dE}{d\theta} = 0$

$$\left(\begin{array}{l} a = 700 \text{ }^\circ\text{C} \\ b \end{array} \right)$$

$$\Rightarrow a + 2b\theta_{\text{neutral}} = 0$$

$$\Rightarrow \theta_{\text{neutral}} = \frac{-a}{2b}$$

$$= \left(\frac{-1}{2} \right) (700)$$

$$\boxed{\theta_{\text{neutral}} = -350^\circ\text{C}}$$

Since, cold junction is at 0°C . Also, neutral temperature must be greater than temperature at cold junction.

\Rightarrow No neutral temperature is possible.