

Problem Set 5

Due Thursday Feb. 13, 2003

1. A temperature sensor has a mass of two grams and is made of a material with a specific heat of $1.7 \text{ J/g}^\circ\text{C}$. Its initial temperature is 22°C . It is in thermal contact with a much more massive biologic tissue with a thermal resistance of $7^\circ\text{C}/\text{J}$. Draw an electrical equivalent circuit for this measurement and plot the sensor's temperature as a function of time starting at the time when it first contacts the tissue. How long does it take the sensor to reach a temperature within 0.5°C of the tissue's temperature?

2. A simplified shunt ohmmeter circuit is shown below. Complete the design of this circuit by determining the value for R_s such that the meter reads zero for $R_x = 0$, and it reads full-scale when R_x is an open circuit. What resistance value for R_x will cause the meter to read exactly half-scale?

