18.34 This problem asks that we determine the temperature at which the electrical conductivity of intrinsic Ge is 40 $(\Omega\text{-m})^{-1}$, using Equation 18.36 and the results of Problem 18.33. First of all, taking logarithms of Equation 18.36

$$\ln \sigma = \ln C - \frac{3}{2}\ln T - \frac{E_g}{2kT}$$

And, from Problem 18.33 the value of ln *C* was determined to be 22.38. Using this and $\sigma = 40\ (\Omega\text{-m})^{-1}$, the above equation takes the form

$$\ln 40 = 22.38 - \frac{3}{2}\ln T - \frac{0.67\ \text{eV}}{(2)(8.62\ \text{x}\ 10^{-5}\ \text{eV/K})(T)}$$

In order to solve for *T* from the above expression it is necessary to use an equation solver. For some solvers, the following set of instructions may be used:

$$\ln(40) = 22.38 - 1.5*\ln(T) - 0.67/(2*8.62*10\text{^}-5*T)$$

The resulting solution is *T* = 400, which value is the temperature in K; this corresponds to *T*(ºC) = 400 – 273 = 127°C.