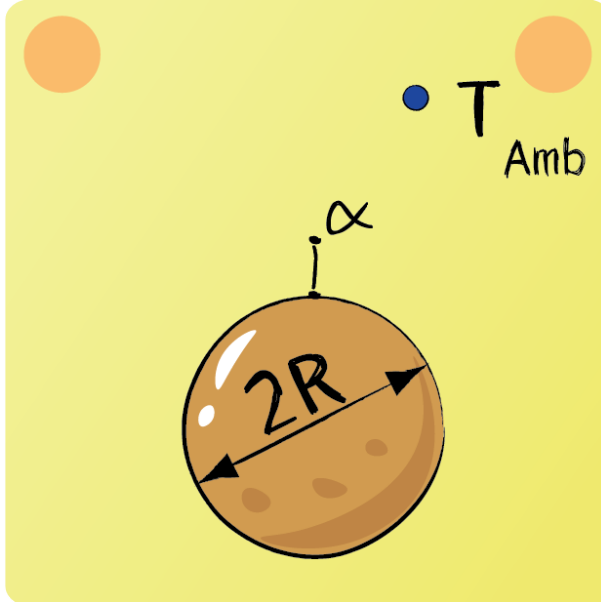# Exam Preparation Conduction 03

Consider a potato taken from a cooking pot with radius R. It exposed to room temperature T_{Amb}. The potato has a homogeneous starting temperature of T_S. The potato reaches a center temperature of $T_{\mathrm{M}} = 63$ °C at $t = 712$ s. Determine its surface temperature T_{S} at that point.

Diagram 7 (formulary) can be used to determine the time, at which the center of the potato reaches the demanded temperature. That is why the reciprocal Biot number and the nondimensional temperature difference need to be determined.

$$\frac{1}{Bi} = \frac{\lambda}{\alpha \cdot R} = 4$$

$$\frac{T_{\mathrm{M}} - T_{\mathrm{amb}}}{T_{\mathrm{S}} - T_{\mathrm{amb}}} = 0,51$$

These values can be used to read off the Fourier number $Fo = 1$ from the diagram. The demanded time can be determined using the Fourier number:

$$Fo = \frac{a \cdot t}{R^2} = \frac{\lambda \cdot t}{\rho \cdot c_{\mathrm{p}} \cdot R^2} = 1$$

$$t = \frac{\rho \cdot c_{\mathrm{p}} \cdot R^2}{\lambda} = 712\,s$$

The surface temperature can be determined using diagram 7(formulary). For this the reciprocal Biot number ($\frac{1}{Bi} = 4$) and the nondimensional radius ($\frac{r}{r_1} = 1$) are required.The nondimensional temperature difference can be determined using the diagram:

$$\frac{T_{\mathrm{S}} - T_{\mathrm{amb}}}{T_{\mathrm{M}} - T_{\mathrm{amb}}} = 0,86$$

The surface temperature T_S can be determined using the nondimensional temperature difference:

$$T_{\mathrm{S}} = 58°\mathrm{C}$$