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BIOMEDICAL ENGINEERING.

Initial Temp = 10°C
2nd Temp = 20°C @ 5min
actual Tem = 25°C.

$dT/dt \propto (T - T_A)$ T_A = actual temp

$\frac{dT}{dt} = k(T-25)$

collecting like terms.

$\frac{dT}{(T-25)} = k\,dt$

$\ln(T-25) = tk + c$

$T - 25 = e^{tk+c}$

$T - 25 = e^{tk} \cdot e^{c}$ where $e^c = A$

$T - 25 = A e^{tk}$

$T = A e^{tk} - 25$

at Initial $t = 0$ $T = 10^\circ C$.

$10 = A e^{0} - 25$

$A = 35$

$\therefore T = 35e^{tk} - 25$

at $T = 20^{\circ}C$ $t = 5$ mins

$20^{\circ} = 35 e^{5k} - 25$

$45 = 35 e^{5k}$

$e^{5k} = 45/35$

$5k = \ln(45/35)$

$k = \frac{0.251}{5}$

$k = 0.05$ //

$T = 35 e^{0.05t} - 25$

@ $T = 24.9^{\circ}$ at $t = ?$

$24.9 = 35 e^{0.05t} - 25$

$24.9 + 25 = 35 e^{0.05t}$

$49.9 = 35 e^{0.05t}$

$e^{0.05t} = 49.9/35$

$e^{0.05t} = \ln(1.426)$

$0.05t = 0.3548$

$t = \frac{0.3548}{0.05}$

$t = 7.09 \simeq 7.1$

$t = 7$ mins 1 second