(8.7) A ^{60}Co irradiation source is calibrated by the Fricke dosimeter for which the *G*-value is assumed to be 1.62 μmol/J. Before the irradiation the optical density *D* of the solution at 305 nm was 0.049 in a 1 cm cuvette. After exactly 2 h the *D* had changed to 0.213. Calculate the dose rate when the molar extinction of Fe^{3+} is 217.5 m^2mol^{-1}.

Begin with the usual definitions:

$Gy := \frac{joule}{kg}$ $\rho := 1024 \cdot kg \cdot m^{-3}$

Then the given data:

$x := 1 \cdot cm$ $\varepsilon := 217.5 \cdot m^2 \cdot mole^{-1}$ $G := 1.62 \cdot 10^{-6} \cdot mole \cdot joule^{-1}$

$time := 2 \cdot hr$ or $time = 7.2 \cdot 10^3 \cdot \text{sec}$

Finally calculate the requested value using eqn. (8.40):

$Dose := \frac{0.213 - 0.049}{\varepsilon \cdot x \cdot \rho \cdot G}$ $Dose = 45.454 \cdot Gy$

$Doserate := \frac{Dose}{time}$ $Doserate = 0.0063 \cdot \frac{Gy}{sec}$

or

$Doserate = 22.73 \cdot \frac{Gy}{hr}$