(9.13) In a solvent extraction system consisting of uranium and lanthanum in 1 M HNO<sub>3</sub> and 100% TBP,  $D_U$ =20 and  $D_{La}$ =0.07. If a phase ratio  $\theta = V_{orc}/V_{aq}$ =0.5 is chosen, how much uranium is removed from the aqueous phase in three repeated extractions? How much of the lanthanum is co-extracted? The fraction extracted with *n* fresh organic volumes ( $V_{org}$ ) from one aqueous volume( $V_{aq}$ ) is:

$$E_n = 1 - (1 + D^* \theta)^{-n}$$

Given data:

$$D_{U} := 20$$
  $D_{La} := 0.07$   $\theta := 0.5$ 

Calculations:

$$E_{3U} = 1 - \frac{1}{(1 + D_U \theta)^3}$$

$$E_{3La} = 1 - \frac{1}{(1 + D_{La} \theta)^3}$$
From eqn.(A.6) on p. 673, but also given in the text.  

$$E_{3U} = 0.999$$

$$E_{3La} = 0.098$$
Hence:
$$E_{3U} = 99.925 \cdot \%$$

$$E_{3La} = 9.806 \cdot \%$$

99.9% of uranium is extracted and 9.8% of La is co-extracted