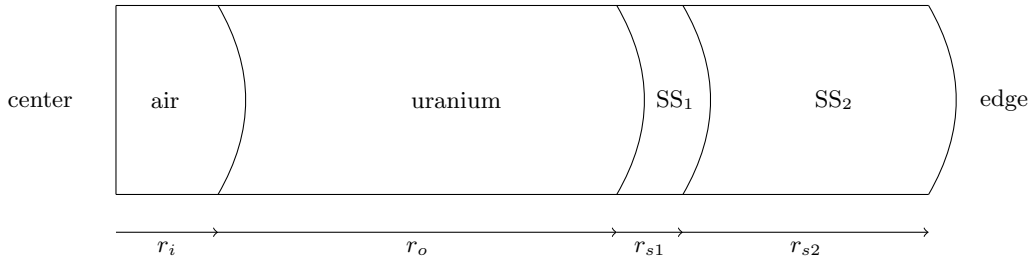
Setting Up Uranium Sphere Problem



1. Remove the Vacuum in the Middle while keeping the original volume

Old Dimensions	New Dimensions
$r_i = 2.686$	
$r_o = 13.25$	$r_u = 13.213$
$r_{s1} = 15.00$	$r_{ss1} = 14.971$
$r_{s2} = 21.5$	$r_{ss2} = 21.486$

For Uranium

$$\frac{4}{3}\pi r_o^3 - \frac{4}{3}\pi r_i^3 = V_u \tag{26}$$

$$\left(\frac{3}{4\pi}V_u\right)^{1/3} = r_u = 13.213 \tag{27}$$

For Stainless (S1)

$$\frac{4}{3}\pi r_{s1}^3 - \frac{4}{3}\pi r_o^3 = V_{s1} \tag{28}$$

$$\left[\frac{3}{4\pi}\left(V_{s1} + \frac{4}{3}\pi r_u^3\right)\right]^{1/3} = r_{ss1} = 14.971 \tag{29}$$

For Stainless (S2)

$$\frac{4}{3}\pi r_{s2}^3 - \frac{4}{3}\pi r_{s1}^3 = V_{s2} \tag{30}$$

$$\left[\frac{3}{4\pi}\left(V_{s2} + \frac{4}{3}\pi r_{ss1}^3\right)\right]^{1/3} = r_{ss1} = 21.486 \tag{31}$$

2. Get Chemistry

Layer	Material	Radius	Mass	Density (ρ)
1	U^{235} 36%	13.213 cm	177997 g	18.4213 g/cm^3
2	Stainless	14.971 cm	32860 g	7.4805 g/cm^3
3	Stainless	21.486 cm	208500 g	7.5837 g/cm^3

3. Determine the Composition
   Uranium

   - 36.6% U-235
   - 63.4% U-238

   Stainless

   - 0.3% Carbon
   - 0.3 % Copper
   - 0.3% Chromium
   - 0.1 % Silicon
   - 0.4% Manganese
   - 98.6 % Iron

4. Calculate the Approximations

   - $D_g = 1/(3\Sigma_t)$
   - $\Sigma_a = \Sigma_t - \Sigma_s$
   - $\Sigma_r = \Sigma_a + \Sigma_s - \Sigma_{s,gg}$