

2)  $I = 10 \mu A = 10 \times 10^{-9} A$  electron beam

answer =  $\frac{\text{electrons}}{s}$

$$= \frac{I}{e} = \frac{1 \times 10^{-8} C/s}{1.6 \times 10^{-19} C} = 6.25 \times 10^{10} \frac{\text{electrons}}{s}$$

3)  $\rho_{Th} = 11.7 \frac{g}{cm^3}$   $L = 50 \mu m = 50 \times 10^{-6} m$   
 $= 5 \times 10^{-5} m$

$n = ?$   $n = \frac{\rho}{A} N_A L$   $A = 232 \frac{g}{mole}$

$n = 1.17 \times 10^{24} \frac{kg}{m^3} \times 6.02 \times 10^{23} \frac{\text{particles}}{mole} \times 5 \times 10^{-5} m$   
 $\frac{0.232 kg}{mole}$   $= 0.232 \frac{kg}{mole}$

$n = 1.52 \times 10^{24} \frac{\text{particles}}{m^3}$

$\rho = 11.7 \frac{g}{cm^3} \left( \frac{100 cm}{m} \right)^3 \times \frac{1 kg}{1000 g}$   
 $= 1.17 \times 10^4 kg/m^3$

4)  $d = 6 mm$   $\rho = 1 m$

$\Omega = \frac{\Delta A}{r^2} = \frac{\pi \left( \frac{d}{2} \right)^2}{(1 m)^2}$   
 $= \frac{\pi \left( \frac{6 \times 10^{-3} m}{2} \right)^2}{(1 m)^2}$

$\Omega = 2.83 \times 10^{-5} sr$