

Experimental Physics IV IPSP

Problem Set 2

Deadline Wednesday, 25.04.2012, before the seminar

Problem 4:

4 points

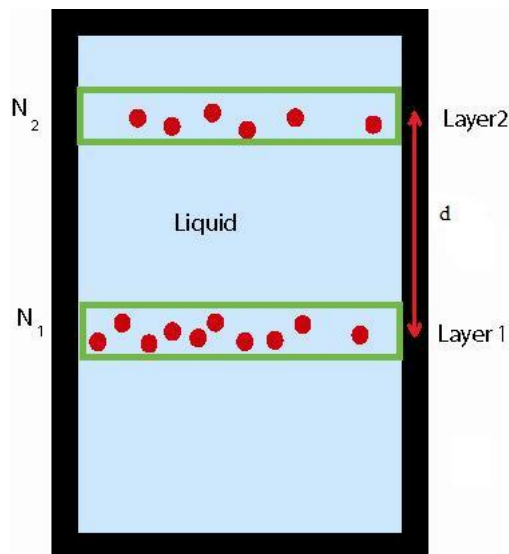
A tungsten filament is 3 cm in length and has a diameter of 5 mm. What is its peak wavelength if the tungsten filament has a temperature of 1900°C? What is its emissive power assuming it is a black body?

Problem 5:

4 points

Perrin found a further way to derive the Avogadro constant. He dissolved colloids with a diameter of 300nm that possess a $0.2 \frac{\text{g}}{\text{cm}^3}$ lower density than the liquid. He found that the number of colloids in two layers with a distance $d = 1\text{mm}$ behaved like 2:1. The liquid has a temperature of 20°C. Derive the Avogadro constant using this data.

Hint: Use the Boltzmann distribution.



Problem 6:

5 points

In Millikan's oil drop experiment an oil droplet (diameter $d = 1\mu\text{m}$, density $\rho \approx 0.92 \frac{\text{g}}{\text{cm}^3}$) is falling between two condenser plates (electric field is turned off, distance of plates: $a = 3\text{mm}$) with a constant velocity downwards. Now, the electric field is switched on ($E = 59\text{V}$) and the droplet is moving upwards with the same velocity.

How many elementary charges does the droplet have?