

110B Homework 5

Consider a metal with susceptibility characterized by a plasmon frequency of 10^{15} Hz and a Γ of 10^{13} Hz for problem 1-4.

1. (20 points)

For a normal incident light at wavelength of 632nm (HeNe laser) onto this metal.

- (a) What is the reflection coefficient and transmission coefficient at the interface?
- (b) What is the skin depth inside the metal?
- (c) What is the reflectivity? How much light is absorbed by the metal?

2. (20 points)

Now for a normal incident light at ultraviolet of 100 nm onto this metal.

- (d) What is the reflection coefficient and transmission coefficient at the interface?
- (e) What is the skin depth inside the metal?
- (f) What is the reflectivity? How much light is absorbed by the metal?

3. (20 points)

For light propagating in this metal, calculate the phase velocity and group velocity as a function of frequency and sketch them in a plot. What is their values at 632 nm, at 100nm, and at the plasmon frequency?

4. (20 points)

Calculate the reflection coefficient as a function of incident angle for s-polarized light at 632 nm.

5. (20 points)

Griffith book problem 9.22 (b).