UNIVERSITÀ DEGLI STUDI DI BRESCIA

Nanophotonics Final Test
June 7, 2018

Student ID:
First Name:
Last Name:

Instructions: You have 2 hours to complete the test. There are 6 questions valued 6 points each. If you need extra blank sheets to complete the test please ask. Please write everything with blue or black ink pen. Use of cell phone, course notes or personal computer will invalidate the results of the test.

Questions:

1. List the most important properties of negative index materials.

2. An object is placed on the left of a right-handed medium [Figure 1.(a)] and a left-handed-medium [Figure 1.(b)]. Using the ray theory, draw the refraction of light at each interface in the two scenarios.

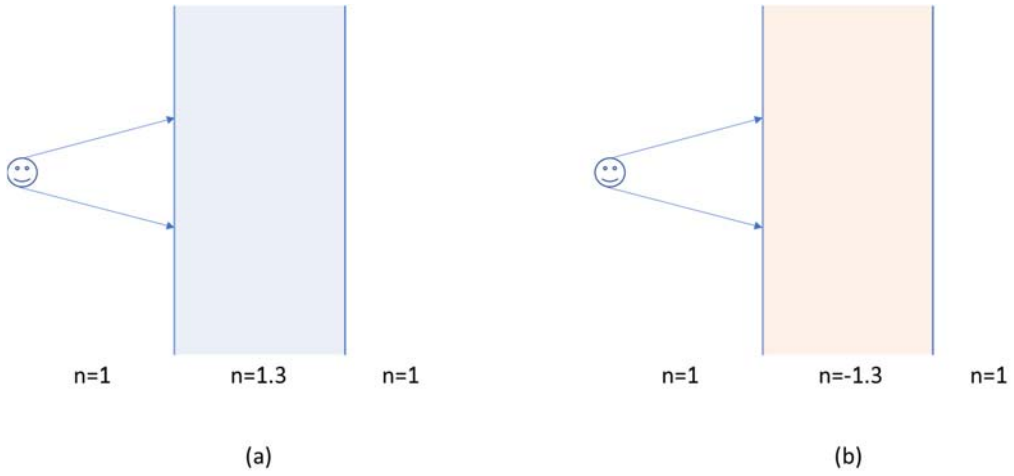

Figure 1

3. Describe the Maxwell-Garnett and Bruggeman effective medium theories. What are the main differences between the two methods?

4. Calculate the effective permittivity of a mixture of spherical inclusions with dielectric constant ε_i=10 immersed in water (ε_h=2) when the fill factor is f = 0.1.

5. Describe the main characteristics of Electron Beam Lithography.

6. Define the depth of field of an optical system and how to increase its value. What happens to the resolution when you increase the depth of field?