Electromagnetism MC4 2002/3 – Multiple choice.

MC4) All of the following questions relate to an E field of general form $\underline{E} = \underline{E}_o e^{i(\omega t - kz)}$ in a plasma with an electron concentration of 7×10^{10} m^{-3}. [Take values of constants to be $c = 3 \times 10^8$ ms^{-1}, $\varepsilon_o = 8.85 \times 10^{-12}$ Fm^{-1}, $m_e = 9.11 \times 10^{-31}$ kg .]

MC4.1) What is the magnitude of the plasma conductivity at a frequency of 3 MHz?

a) 6.0×10^7 Ω^{-1} m^{-1} b) 1.0×10^{-4} Ω^{-1} m^{-1} c) 5.0×10^{-4} Ω^{-1} m^{-1}

d) 3.4×10^{-5} Ω^{-1} m^{-1} e) None of the previous

MC4.2) What is the value of the plasma frequency?

a) 4.5 MHz   b) 2.4 MHz   c) 0.3 MHz   d) 1.7 MHz

e) None of the previous

MC4.3) What is the phase velocity of a 3.0 MHz wave propagating through the plasma?

a) 2.6×10^8 ms^{-1} b) 3.8×10^8 ms^{-1} c) 3.0×10^8 ms^{-1} d) 4.9×10^8 ms^{-1}

e) None of the previous

MC4.4) What is the refractive index of the plasma at 2.6 MHz?

a) 0.82   b) 1.4   c) 0.41   d) 1.0   e) None of the previous

MC4.5) By what factor is $\underline{B}$ reduced in a distance of 150 m if the frequency is 1.8 MHz?

a) 130   b) 0.02   c) 16   d) 37   e) None of the previous